FEBRUARY, 1957

TRAFFIC ENGINEERING

- A Forward Look at Traffic Engineering
- Acceleration Lane Lengths for Heavy Commercial Vehicles
- A Story of a Bowser Mechanical Garage
- A New Traffic Delay Measuring Device

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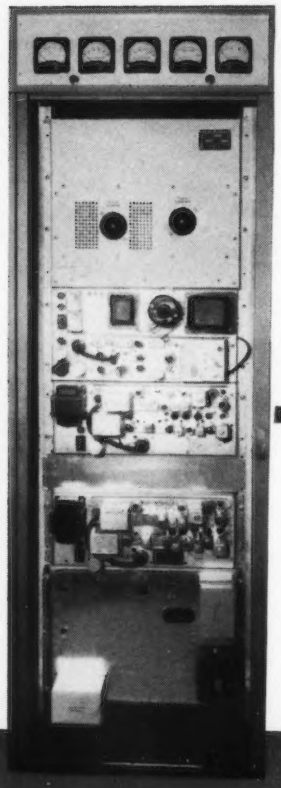
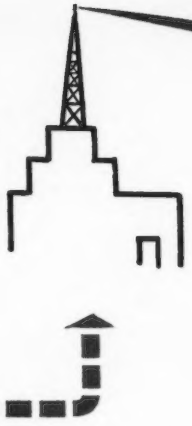
Master Tone Translator





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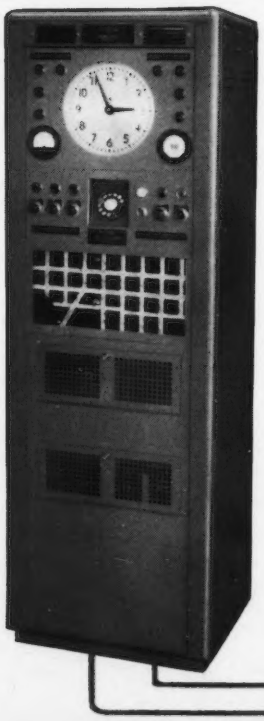

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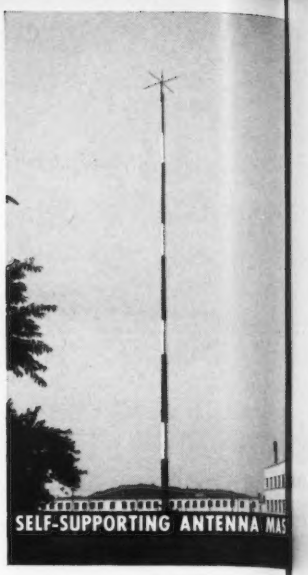

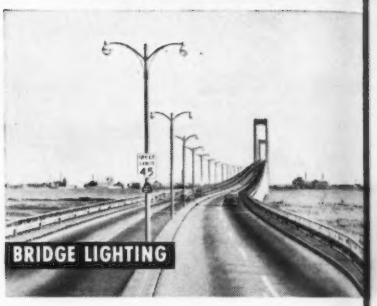

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Frankly Speaking . . .

Traffic Engineering and Accident Prevention

DURING THE RECENT HOLIDAY SEASON, many of our newspapers carried articles on highway safety. The intent of these was commendable but too many placed the entire blame for accidents on the driver. It is easier to place widespread blame of accidents on drivers when the true causes of these mishaps are not understood. However, this is a dangerous practice because it leads to excessive regimentation of drivers and confuses the real issues involved.

Drivers are not intentionally involved in accidents. Too often, sudden changes in traffic flow and unexpected roadway factors catch drivers by surprise with disastrous results. In many of these cases it may be truthfully said that the accident was caused by a roadway too hazardous for motorists.

There is no question about the need for traffic regulations and good enforcement to curb extreme and irrational driving practices. However, the traffic engineer has constructive measures as well as regulatory measures in his professional repertoire. Only the traffic engineer may logically choose between this alternate approach in the solution of specific traffic accident problems. The traffic engineer who accepts the doctrine of driver regimentation for safety without careful study of the inherent safety features of the constructive approach is doing only one-half of his job.

Two important examples which recognize this broad concept are present in recent actions by the Congress of the United States. First, a Special Subcommittee on Traffic Safety, headed by Congressman Roberts, has been holding hearings and will hold more, looking toward a determination of accident causes. The Institute has filed a statement with this group, emphasizing the need for facts based on research and not on opinion. Other engineers may have similar opportunities and should avail themselves of the chance to be heard.

A second example is the Highway Safety Study authorized by the recent Federal Act, now underway in the Bureau of Public Roads. Members of the Institute should make important contributions to this vitally important research activity.

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A Forward Look At Traffic Engineering

The text of an address by John A. Volpe, Federal Highway Administrator before the Washington, D.C. Section of the Institute of Traffic Engineers, January 8, 1957.

John A. Volpe speaking as President McMonagle listens.

IT IS WITH A FEELING OF PRIDE in the cooperative spirit with which our scientific and technological problems are solved that I address you. This dinner, being held during the 36th annual meeting of the Highway Research Board, has brought together research groups from all sections of the country who have played a most important role in the development and operation of the world's greatest highway system which has had such a revolutionary impact on the American economy.

You represent all levels of government—State, Federal, city, and county—as well as Universities and the principal highway user groups. Despite this diversity, you all have a common purpose—the improvement in the efficiency and safety of highway transportation through research. I know of no other group which more fully realizes that the primary purpose of highway construction is to move persons and goods, and whose daily tasks are more directly associated with the elimination of congestion. It is also through the efforts and cooperation of this group that means will be found and placed in effect to accomplish a substantial reduction in the accident toll.

With the passage of the Federal-Aid Highway Act of 1956, a bipartisan action by Congress, a new emphasis was placed on the freedom of vehicular movement. The vital role that highway transportation plays in our daily lives and in our economic growth was recognized when the biggest road-building program in all history was launched. As most of you know, $24.8 billions of Federal funds were authorized for the National System of Interstate and Defense Highways. This amount, plus $2.6 billion contributed by the States is to modernize the 40,000-mile network over a 13- to 15-year period with divided highways protected by carefully planned access. Federal-aid for highways other than the interstate system was increased by $125 million over prior authorizations for 1957, and $850 million and $875 million were authorized for the fiscal years 1958 and 1959, respectively.

These figures are so imposing that it is difficult to visualize the full effect that such a program will have on the future economic progress of our country and upon the American way of life. It is by far the most important milestone in our transportation history. The direct economic effects are bound to be Nationwide and long lasting.

The interstate system will connect 90 percent of the cities of more than 50,000 population and link business and industrial centers from coast to coast. Though only 1.2 percent of the Nation's total mileage of roads and streets, it is expected to carry 20 percent of all traffic. Traffic will move into and around large cities at expressway speeds on an integrated highway system built to modern standards and designed to meet traffic demands 20 years from now—when it is expected that there will be 100 million motor vehicles compared to today's 65 million. These figures are not new to most of you who have seen and struggled to alleviate the build-up of today's fantastic congestion.

Approximately 50 percent of the funds for the interstate system will be spent in cities and around them, to wipe out today's king-size traffic jams, thus speeding up traffic on the city streets. This does not mean, however, that the services of traffic engineers will be any less demanding. Quite the opposite is true.

The extremely high cost per mile of urban facilities makes it essential that they be properly located to insure wise expenditure of State and Federal funds. Correct location is even more important to the cities themselves for these

freeways will be integral links in the urban transportation network. Properly located they can encourage good urban development and be of great benefit to a community. Improperly located they can impair or even prevent desirable growth and community life. It is for this reason that I have urged State highway officials to seek and to utilize the cooperation of city officials in locating urban expressways. Surely there should be no one more qualified to advise the officials on current traffic conditions than a competent city traffic engineer.

Much needs to be done by the cities to insure their ability to cooperate with the States in planning these facilities. In most of the large cities the responsibility in connection with traffic management is not centralized. Some have numerous organizations with overlapping or indefinite responsibilities such as a traffic commission, a public works department, a city engineer, a planning commission, a parking authority, and a transit authority. It would be a great help to the States if they could deal with one agency in a city such as a street transportation department. The traffic engineer can be of help in bringing this about, acting as a "bridge" because traffic operational problems are of common interest and are ones for which groups can be brought together. It is most gratifying that a Joint Committee of the American Association of State Highway Officials and the American Municipal Association is at work on this problem.

It is fortunate also that the National Committee on Urban Transportation, composed largely of city officials, has been at work preparing manuals for the collection of highway planning data for cities comparable to that available for rural highways through the Statewide Highway Planning Surveys. It is only logical that the traffic engineer with his technical ability should have an important role in coordinating the collection of this information and its application to the cities' transportation problems.

Now as never before must we marshal and skillfully deploy our technical and professional resources. The Federal-Aid Highway Act of 1956 embodies a relatively new concept, in that it calls for controlled access for an entire nationwide network. Controlled access does not eliminate the need for traffic control—even though it is expected that when this system is complete, it will be possible to drive from coast to coast without stopping for a single traffic signal.

New and improved operational skills and techniques will be required to insure the smooth and safe flow of traffic, especially through urban areas. That this is true has already become apparent on some of the freeways now in use. Trouble spots must be detected as they occur so that action may be taken immediately for their correction without waiting until the freeway and adjoining street systems become clogged with vehicles at a standstill. The use of closed circuit television for scanning the freeways is one possible application of recent electronic developments to traffic control. Other types of detection such as radar which has proved so useful in enforcement of speed regulations are also being tried. It may not be long before high speed computers are used in connection with the control of traffic on our city streets and expressways. They are already being used in the analysis of traffic data and attempts are being made to use them in the simulation of traffic conditions.

It is not surprising that the most recent refinements in highway geometry have arisen from consideration of operational rather than structural demands. More than ever, the future will require a strong diversified highway transportation team. Operations will continue to become a more important aspect of highway transportation as vehicle registrations continue to grow.

With the interstate system carrying an expected 20 percent of all traffic and vehicle use continuing to increase at roughly 4 percent per year, it is evident that there will still be a gigantic problem of traffic control on the other systems of streets and highways. This deduction requires only simple arithmetic.

Greatly increased expressway use will require improved techniques to relate the expressway location and design to existing street patterns. In turn, when the expressway is built, proper and efficient control on the city streets must be provided so that both facilities will function as an integrated highway system.

Dealing with traffic volumes of the magnitude that use freeways and connecting roads and streets is no "small time" operation. You are affecting the daily lives of millions going to and from work and the speed and efficiency of commercial vehicles which have become such an important and necessary link in our industrial development and in cross country as well as rural and urban transportation.

That there will be an increasing need for new techniques in handling traffic through proper signing, marking, and control was forcefully illustrated a few weeks ago. Peak-hour traffic on a 2-mile section of the Shirley Highway —a freeway of fairly modern design— had been reduced to a "snail's pace" by traffic entering in two lanes from one of the ramps and by an unusually large number of drivers shifting back and forth between lanes trying to get ahead of the other drivers. Traffic over the section made frequent starts and stops. Clutches and brakes received abnormal wear. Gasoline consumption was high and wasted time skyrocketed to over a million man-hours per year for the 1½ hours of peak flow as compared to traffic moving at 30 miles per hour.

Traffic was confined to one lane on the ramp through the use of rubber cones, and signs costing about $100 were installed to control traffic on the freeway. With a minimum amount of enforcement, drivers cooperated nearly 100 percent. During the week that the experiment was in effect, traffic moved smoothly at an average speed approaching 30 miles per hour—not high for a freeway except in comparison with the former crawl speed. Lane shifting with the resulting high potential accident possibility was practically eliminated. The traffic flow in the two lanes was increased from 3,600 to over 4,000 per hour.

The public reaction was so favorable that suggestions were received to apply the same technique to a ramp at another location. The results of a short study at the other location showed that the control applied at the one location would not be feasible at the other. This illustrates the growing need for traffic engineering studies so that the most appropriate solution can be applied to each individual problem.

The freeway development will require more aggressive traffic planning at interchanges, particularly in urban areas. Here is an immediate challenge to operations engineers working with other highway specialists. The related service areas, and the large shopping and industrial areas, as well as sub-

urban residential areas — which are bound to develop—will require sound traffic operational patterns, including suitable provision for terminals. Relating their design and operation to adjacent freeways and other major highways and streets calls for effective traffic management and planning. For those of you who are connected with colleges and universities, may I suggest that increased emphasis be placed on traffic management in your highway courses.

The design of the interstate system will provide for the rapid movement of all types of vehicles including passenger cars, trucks, interstate and local buses, and in some cases, in and near urban areas, tracks for rapid transit trains will be located within the rights-of-way. The provision of transit facilities on these freeways is, however, no assurance that patronage will be sufficient to relieve downtown streets of the avalanche of automobiles that harass traffic officials. A recent article in your official publication, TRAFFIC ENGINEERING, advised that a surface transit route in Chicago moves about 9,000 passengers per hour in and out of the loop. This is considerably less than the number of people in automobiles that can be accommodated by four lanes of an expressway. But do all rapid transit facilities fare this well? Let us consider the Oakland Bay Bridge, for example, where competing service between automobiles and rapid transit vehicles is provided on a single structure. It has been estimated that during 1956, a total of 52 million persons crossed the bridge by automobile, while 5.5 million made the crossing on the rapid transit trains. Automobiles carried approximately 9.5 times as many people across the bridge as did the rapid transit trains. The roadway width for automobiles is 59 feet as compared to 27 feet on the section reserved for the rapid transit lines. Automobiles carried 4.3 times as many people, per unit of bridge width, as were carried by rapid transit.

The portion of the lower deck which is used by bus and truck traffic carried nearly 50 percent more persons per foot of bridge width than the transit trains — this in addition to the estimated 18 million tons of payload hauled by the trucks. Admittedly, this example may be no more typical than those in the TRAFFIC ENGINEERING article.

This same article in TRAFFIC ENGINEERING displays a photograph which, together with its caption, informs us that one bus carries as many people as are carried by automobiles of sufficient number to occupy one full city block of a 6-lane street. Is this statement truly representative of typical conditions? Some of you may have heard a paper this afternoon which reported the findings of a transit study conducted cooperatively by highway departments and the Bureau of Public Roads in two large cities and in which the transit industry participated.

A passenger in an automobile was found to occupy approximately six times as much space in the traffic stream as a bus passenger. The rate of travel of the bus passenger was, however, only two-thirds that of the automobile passenger. The study showed that on expressways the automobile passenger ocupies almost 11 times the space occupied by a bus passenger. This ratio is still considerably short of that expressed in the photo caption referred to above. Let us not confuse potential ability with reality; to do so will worsen rather than relieve an already aggravated situation. The assembly of facts, and the recognition of these facts, is the first step toward a solution. Then the development of corrective measures may proceed on a realistic basis.

Sound development in planning or traffic engineering can come only through an understanding and application of all the facts; and facts come only through painstaking research. It has been largely through research into the development of basic principles of vehicular movement and driver behavior that traffic engineering is now generally recognized as one of the specialized phases of highway engineering. It is a new science of traffic flow characteristics that is fundamental to street and highway design, operation, and administrative policy.

The traffic engineer engaged in research has the streets and highways of the Nation as his laboratory. Almost every conceivable type of intersection design, alinement, and traffic condition may be found; and studied through the use of modern electronic equipment developed for this purpose. Research must be continued to learn why certain existing freeway design features work so well while others are inadequate, ineffective, or unduly hazardous. As new sections of the interstate system are opened to traffic, such research can be of great value in guiding future design. For the first time, a long-range program has been authorized making it possible for everyone involved to plan ahead. We must take full advantage of this opportunity.

The 1956 Act, besides authorizing an unprecedented program of construction, calls for five major studies. The first one calls for estimating the cost of completing the interstate system. The results are to provide the basis for apportioning future interstate funds. Most of you have already been involved in this study.

The second study is to determine the maximum sizes and weights of vehicles that should be permitted to operate on the Federal-aid highway systems. This morning you hear a progress report by the Director of the AASHO road test in Illinois. This test will provide the major portion of the data required, but much additional information on the frequency and magnitude of axle loads as well as facts on vehicle costs will be required.

The third study is to provide Congress with information that will aid it in making a determination with respect to reimbursement for highways, both free and toll, which are part of the interstate system, that were constructed between 1947 and 1957, and that "measure up" to the interstate standards. The ground work is being laid for this study and will be initiated soon.

The fourth study is a most important one. It concerns all of you and relates to highway safety. In accordance with the terms of the Act it will give consideration to:

(1) the need for Federal assistance to State and local governments in the enforcement of necessary highway safety and speed requirements, and the forms such assistance should take;

(2) the advisability and practicability of uniform State and local highway safety and speed laws and what steps should be taken by the Federal Government to promote the adoption of such uniform laws;

(3) possible means of promoting highway safety in the manufacture of the various types of vehicles used on the highways;

(4) educational programs to promote highway safety;

(Continued on page 238)

Acceleration Lane Lengths for Heavy Commercial Vehicles

by Thomas B. Deen

(Jun. Mem., ITE)

Traffic Analyst, Nashville, Tennessee

Condensed from a thesis prepared in partial fulfilment of requirements for a certificate from the Yale Bureau of Highway Traffic.

RECENT CONGRESSIONAL LEGISLATION has assured us of thousands of miles of new highway to be built in the near future. Standards for the new roads which have been released thus far reveal that much of the new highway mileage will be of the limited access type with grade separations at intersections. The only ingress to these roads will often be via an acceleration lane.

Heavy commercial vehicles will make up a substantial part of the traffic using the new facilities and in view of the heavy taxes levied on operators of trucks and buses it would seem that these vehicles should be considered in design whenever feasible, particularly at those access points which serve large numbers of commercial vehicles.

Heretofore, the only standards[1] used in determining the length of acceleration lanes have been based on the acceleration characteristics of passenger cars partially because it was believed that design for trucks and buses would result in lane lengths which would be economically unfeasible, and partially because little factual data was available for lane lengths required for heavy commercial vehicles. The truck and bus acceleration information that is available is either for very short acceleration distances, with the result that data only for low speeds are obtained,[2] or is concerned with the *maximum* acceleration for which the par-

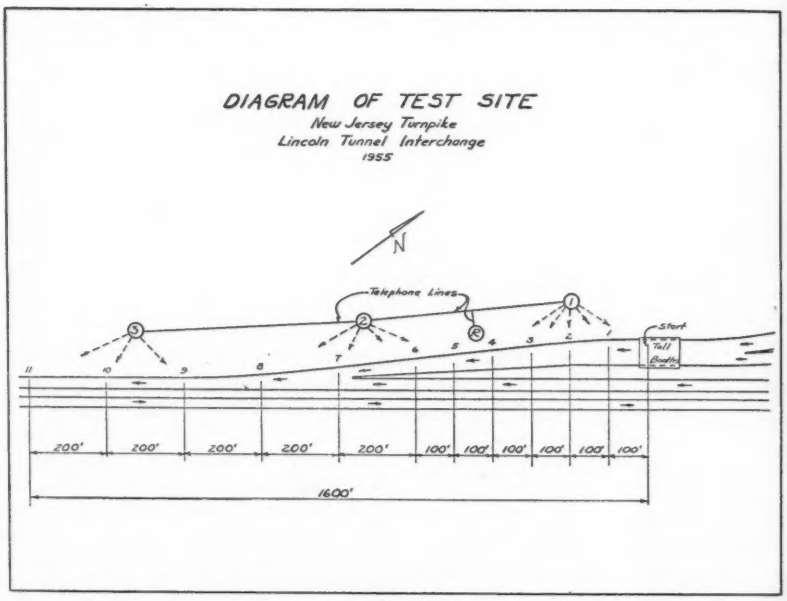

Figure 1

Figure 2

1 *A Policy on Geometric Design of Rural Highways*, American Association of State Highway Officials, Washington, D.C., p. 288, 1954.

2 Greenshields, *et al*, *Traffic Performance at Urban Street Intersections*, Technical Report no. 1, Bureau of Highway Traffic, Yale University, 1947.

ticular vehicles are capable.[3] It is believed that data of this latter nature are not adequate for proper determination of acceleration distances actually required on the highway because acceleration of vehicles depends, not only on vehicle capabilities but also on driver preferences. Use of maximum acceleration data for design would have to assume that truck drivers utilize maximum acceleration whenever driving on acceleration lanes. The validity of this assumption is unknown. However, even if the assumption were true, the maximum acceleration of a given vehicle varies, depending on how heavily it is loaded. Thus field experiments, with so called "typical" vehicles fully loaded, are not adequate for determination of even maximum acceleration which might be experienced on the highway since it is known that trucks travel often with less than a capacity load. It is believed that the only method for determining realistic values for commercial vehicle acceleration as found on the highway is to sample the acceleration rate actually being used by commercial vehicles on a high type roadway without the drivers being aware that they are being observed. Such information was gathered, analyzed, and summarized in this study.

Method of Study

A satisfactory site for the study was found at the Lincoln Tunnel Interchange on the New Jersey Turnpike. Figure 1 shows a sketch of the roadway and Figure 2 is a picture of the site showing the acceleration lane and toll booths. All vehicles were required to stop at the toll booths before proceeding through the acceleration lane onto the turnpike. Extending along the right side of the acceleration lane and parallel to it is a large bluff or bank estimated to be forty feet high from which the observers could be located with no chance of being detected by the drivers. The site is level except at the very end of the trap. Measuring horizontally from the toll booths, a gradual vertical curve begins at 1400 feet, and the grade between 1400 and 1600 feet averages about plus 0.4 percent. No roadside development interferes with the traffic and there are no pedestrians. Stations at measured distances from the toll booths (Figure 1) were marked by painting a whitewash line on the edge of the pavement and extending onto the shoulder. These stations were marked each 100 feet for the first 600 feet and each 200 feet thereafter for a total distance of 1600 feet.

By locating the observers, as shown in Figure 1, it was found that each station could be plainly seen by at least one observer. Field telephones were set up connecting all the observers with each other and with the recorder operator (R), located in a car at the position shown. The recorder operator recorded (using an Esterline-Angus twenty pen graphic recorder) the time required for the vehicles to travel from one station to another. From this, vehicle speed could be computed and, from the speed changes, vehicle acceleration could be determined.

All heavy commercial vehicles were separated into four categories, and the number observed in each category was as follows: buses (51), single unit trucks (59), semitrailer combinations having single axle on trailer (55), and semi-trailer combinations having tandem axles on the trailers (39).

Since the purpose of the study was to sample the acceleration rate of trucks under highway conditions, there was no real necessity in distinguishing between loaded and unloaded vehicles. However, in order to make the data as conservative as possible, vehicles which were obviously empty were not included in the sample. Doubtless,

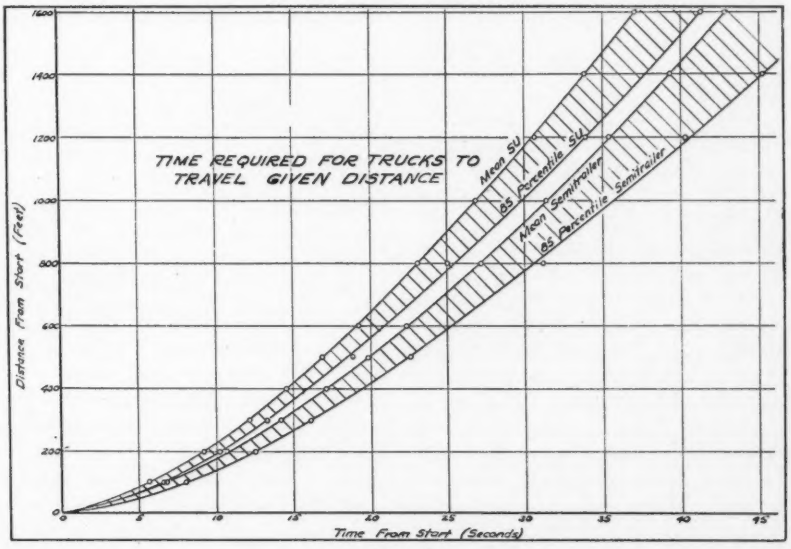

Figure 3

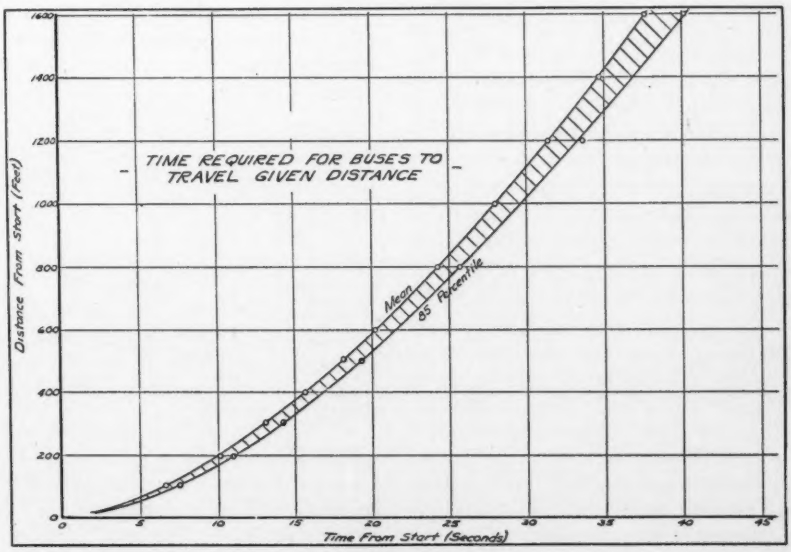

Figure 4

[3] See Fig. 9.

some trucks of the enclosed van type were included, though unloaded, because their design prevented the verification of their load. A very small percentage of all trucks were eliminated because of their not being loaded. No buses were eliminated for this reason.

Analysis of the Data

The initial examination of the data revealed that while the data was broken down into four classifications originally, there was no need in proceeding with more than three. Semitrailer trucks with single rear axles and semitrailer trucks with tandem rear axles had nearly identical acceleration characteristics. The difference between the mean times required for the two groups to travel the 1600 foot length of the trap was only 1.5 seconds, the single rear axle types requiring 43.5 seconds and the tandem types requiring 42.0 seconds. Logic would dictate that this be the other way around with the tandem type requiring the longer travel time. The explanation of this was that the number of observations of each type of truck was not adequate to lend any significance to the difference between the two means. Four spot checks were made on the remainder of the data to determine its statistical adequacy for the purpose of this study. It was determined that recorded values were within the limits required.

In Figures 3 and 4 are curves drawn from the data showing graphically the relationship between the acceleration time and distances reached for each type of vehicle. In order to give an indication of the dispersion of the data, the 85 percentile curve was drawn from values found at selected points along the trap. For example, at the 800 foot station, the time was computed which was greater than that required for 85 percent of the vehicles in each class to travel the first 800 feet of the trap. Similar values were found for other stations and the curves drawn.

It can be readily seen that the semitrailer combinations require more time to travel the trap length than either the buses or single unit trucks and that the range of time required is greater for the semitrailers than for the other two classifications. The buses in the sample accelerated more uniformly than any of the other classifications, there being only about 2.5 seconds difference between the mean and the 85 percentile time at the 1600 foot station. The surprising thing shown on these curves is that the mean single unit truck traveled the length of the trap more quickly than the buses. However, as will be shown, this does not mean that they were traveling at a higher speed when they arrived at the end of the trap.

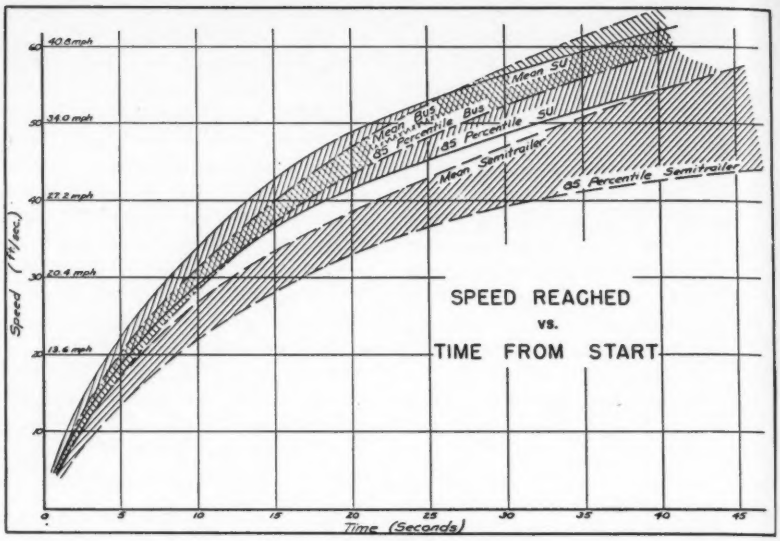

Figure 5

The values of the slopes of the curves in Figures 3 and 4 at any instant of time are also the values of the speed reached at that same instant. By measuring the slopes at five second intervals and plotting them against time, Figure 5 was drawn. Again the semitrailer combinations are shown to be moving slower than the other two classifications at any instant. The mean single unit truck moved faster than the two groups during the first 26 seconds after which the mean bus moved at a faster pace.

The 85 percentile curves in Figure 5 were obtained from Figures 3 and 4 just as the mean curves were. However, the interpretation of the 85 percentile curve shown in Figure 5 should be made with caution. The 85 percentile curve in Figure 5 does *not* show the speed (in each class) which is less than that of 85 percent of the vehicles at any instant. What the curve does show can best be explained by an example.

The 85 percentile semitrailer from Figure 5 is shown to have reached a speed of 41 feet per second after 35 seconds of travel. As stated before, this does *not* mean that after 35 seconds of travel 85 percent of the semitrailer combinations were traveling faster than 41 feet per second. It does mean that the truck which for the first 35 seconds of travel has moved less distance than 85 percent of the other semitrailers, is now moving at a speed of 41 feet per second. The difference between the two 85 percentile values is not clear although logic dictates that there would not be much difference between them. The actual 85 percentile speed curve was not caluculated because the length of time required for computation for each sample would be prohibitive. All the 85 percentile curves shown in succeeding figures are subject to this same criticism.

The value of the slope of each curve in Figure 5 at any instant is also the value of the acceleration at that instant. By measuring the slopes at five second intervals and plotting the values against time, the curves in Figure 6 were drawn. The general conclusions reached in observing Figures 3, 4, and 5 are readily apparent here. Single unit trucks are shown to have the least rate of acceleration after 21 seconds of travel. It is of significance to remember however, that even though the semitrailers accelerate at a higher rate than the single unit trucks after the first 21 seconds of travel, they are actually traveling at a considerably lower speed during the entire trap length.

Figure 7 was drawn from values taken from Figures 3, 4, and 5, and shows the distance required for vehicles to reach various speeds from a

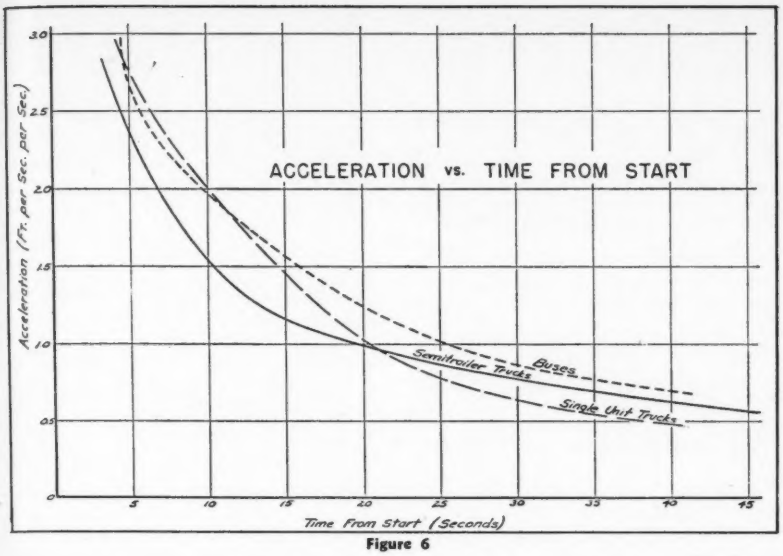

Figure 6

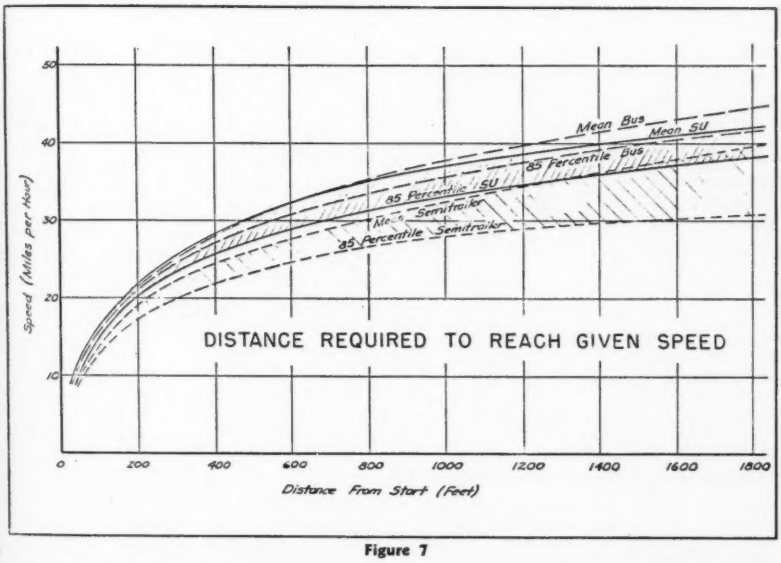

Figure 7

stop. It can be seen that whereas the mean single unit truck travels at a slightly higher speed than the mean bus for the first 600 feet, thereafter the bus is traveling at a higher speed. At the end of 1600 feet both vehicles are still accelerating but the bus is accelerating at a higher rate. The mean single unit curve and the mean semitrailer curve show indications of becoming asymptotic at some point beyond the end of the trap, indicating an approximately equal ultimate speed for the two groups.

Figure 7 can be used directly to determine the length of acceleration lane required for any vehicle studied to accelerate from a stop to any given speed. For example, an acceleration lane designed to accommodate the acceleration of the average bus from zero to 35 miles per hour would have to be 800 feet long.

If it can be assumed that the curves in Figure 7 are valid for vehicles which enter the acceleration lane at a speed other than zero, then the curves can be used more extensively. For example, if it is desired to find the length of acceleration lane needed to allow a single unit truck to enter the lane at a speed of fifteen miles per hour, and then increase its speed to thirty-five miles per hour before merging with the through traffic, then the length can be found from Figure 7 as follows:

Distance required to accelerate
from 0 to 35 mph = 800′
from 0 to 15 mph = 90′
from 15 to 35 mph = 710′

Use of the Data In Design

Current standards for design of the length of acceleration lanes as recommended[4] by the American Association of State Highway Officials are based on the "normal" passenger vehicle acceleration rate as determined by Loutzenheiser.[5] These acceleration rates were found by placing speed recording instruments in passenger cars and instructing drivers to accelerate at their normal rate. Thus acceleration lane standards are now based on *average* passenger car acceleration. No effort is made to design for the eighty or ninety percentile vehicles, probably because it would result in excessive lane lengths. In view of this, no lower than average (mean) acceleration rates could be justified in design for trucks. Therefore, only the mean curves in Figure 7 will be considered in further discussion.

For the purposes of comparison of the lengths of acceleration lanes designed for commercial vehicles (using the curves in Figure 7) and those designed for passenger cars, Tables I, II, III, and IV have been prepared. Values in Table I are currently used as the standards for length of acceleration lanes for high volume highways.[6] In tables II, III, and IV, are values for the lengths of acceleration lanes based on Figure 7. In preparing Tables II and III it was assumed that trucks travel at an operating speed at least five miles per hour less[7] than passenger cars and that they would therefore merge with the through traffic at five miles per hour less than the speed of the through traffic. This assumption is, of course, not valid for buses (Table IV) which operate at a speed equal to or perhaps greater than passenger cars. It can be seen from Table I that all of the current standard lengths for design speeds of fifty miles per hour or less are adequate now for single unit trucks. It is also apparent that current standards for lengths, when a design speed of sixty miles per hour or higher is used, are completely inadequate for all heavy commercial vehicles.

All of the data and related discussion of this report have been concern-

4 American Association of State Highway Officials, op. *cit.*, p. 494.

5 Loutzenheiser, D. W., "Speed Change Rates of Passenger Vehicles." *Proceedings of the Highway Research Board*, Volume 18, pp. 90-99, 1938.

6 American Association of State Highway Officials, op *cit.*, p. 494.

7 *Ibid.*, p. 166.

TABLE I

ACCELERATION LANE LENGTHS BASED ON ACCELERATION RATE OF PASSENGER CARS

Design speed mph	Running speed mph	Entrance curve design speed (mph)						
		stopped	15	20	25	30	35	40
		Assumed actual entrance speed (mph)						
		0	14	18	22	26	30	34
30	27	280*	220**	170**	110	--	--	--
40	34	510*	450*	400*	340*	250**	140**	--
50	40	780*	720*	670*	610*	510*	400*	260**
60	45	1060	1000	950	890	790	680	540

*Lengths which are adequate for single unit trucks
**Lengths which are adequate for both single unit and semitrailer trucks

TABLE II

ACCELERATION LANE LENGTHS BASED ON ACCELERATION RATE OF SINGLE UNIT TRUCKS

Design speed mph	Pass. car running speed	Assumed truck running speed	Entrance curve design speed (mph)								
			stop	-	10	15	20	25	30	35	40
			Assumed actual entrance speed (mph)								
			0	5	10	14	18	22	26	30	34
30	27	22	200	190	270	130	80	--	--	--	--
40	34	29	420	410	390	350	300	220	110	--	--
50	40	35	780	770	750	710	660	580	470	310	80
60	45	40	1400	1390	1370	1330	1280	1200	1090	930	700

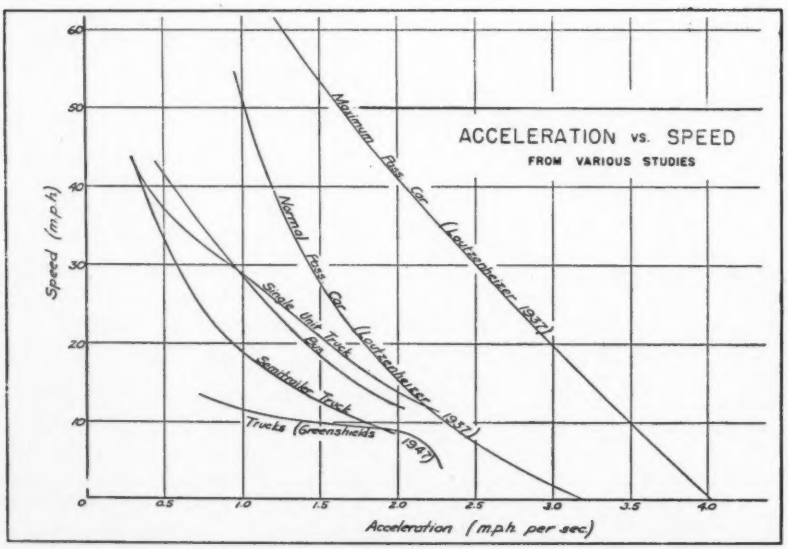

Figure 8

ing vehicle accelerations on a level or nearly level grade. Further, no lengths of acceleration lanes for a design speed of 70 miles per hour could be determined because of the the limited length of trap over which the vehicles were checked. Further study should be made on this subject (1) on grades other than level, (2) using a greater trap length in order to determine acceleration rates at higher speeds, and (3) at varied locations to find whether the values obtained in this study are representative.

Comparison with Other Studies

As was previously stated, very little acceleration data for commercial vehicles has heretofore been available. Figure 8 shows the relationship of acceleration rate to speed attained for various types of vehicles. The curves shown for single unit trucks, buses and semitrailer trucks were derived from data gathered in this study. The other curve for trucks was taken from data gathered by Greenshields in 1947.[8] Forty-four medium weight trucks were photographed with a motion picture camera as they started from a signalized intersection in New York City. From this film, accelerations were computed. Since the ultimate speed reached by the trucks was only about fourteen miles per hour, the acceleration rates used in gaining speed were much lower than found in this present study where the ultimate speed was greater than forty miles per hour. Only at speeds of nine miles per hour or less do the two studies show indications of producing somewhat equal acceleration rates. The normal passenger car curve shown in Figure 8 was taken from a study conducted by Loutzenheiser in 1937.[9] The acceleration rates indicated by this curve are the ones used in the design of acceleration lanes for passenger cars under current standards (Table I). At speeds of ten miles per hour or less it can be seen that the acceleration rates of single unit trucks and buses are approximately equal to those used in normal passenger car acceleration. Above ten miles per hour the divergence between acceleration rates for passenger cars and commercial vehicles grows larger with increasing speed. The curve for maximum passenger car acceleration shown in Figure 8 shows,

8 Greenshields, *et al*, *op. cit.*, p. 22.

9 Loutzenheiser, D. W., *op. cit.*, pp. 90-99.

as expected, significantly larger acceleration rates throughout the entire speed range than any of the other curves.

Figure 9 shows the relationship of acceleration distance to speed attained for various vehicles. Curve A shows the normal passenger car acceleration as determined by Loutzenheiser and plotted in Figure 8. Curves B, C, and F. are taken from Figure 7 and were derived earlier in this report. Curves D and E were computed from the Society of Automotive Engineers *Truck Ability Prediction Procedure*.[10] This procedure allows an accurate estimate of the maximum acceleration which might be expected for a given truck if the weight and horsepower of the truck are known. Curve D was computed for a truck with a gross vehicle weight of 26,500 pounds and a weight-horsepower ratio of 235. Curve E was computed for a truck with a gross vehicle weight or 116,500 pounds and a weight-horsepower ratio of 420. These values of weight and horsepower for curves D and E are assumed to be representative of the SU and C-50 standard vehicles used in current design.

It is interesting and perhaps significant to note the similarity between the 85 percentile single unit truck curve found in the study and the acceleration curve for the SU design vehicle as determined from the Society of Automotive Engineers formula. The same similarity is noted between the 85 percentile semitrailer truck curve and the C-50 curve. The fact that curves D and E (Figure 9) are curves of maximum vehicle acceleration would seem to dictate that they show greater acceleration rates than curves C and F which are based on normal acceleration rates. However, it must be remembered that curves D and E are computed for heavily loaded vehicles, while curves C and F were obtained from a sample which doubtless included many partially loaded and some unloaded vehicles.

Conclusions

Single unit trucks accelerate at a higher rate than other heavy commercial vehicles at speeds below twenty-nine miles per hour. Buses accelerate at a greater rate above twenty-nine miles per hour. Semitrailer trucks accelerate at the lowest rate of the commercial vehicles studied.

10 Society of Automotive Engineers, *Truck Ability Prediction Procedure*, (SP-82), Society of Automotive Engineers Incorporated, New York.

TABLE III

ACCELERATION LANE LENGTHS BASED ON ACCELERATION RATE OF SEMITRAILER TRUCKS

Design speed mph	Pass. car running speed	Assumed truck running speed	Entrance curve design speed (mph) stop	-	10	15	20	25	30	35	40
			Assumed actual entrance speed (mph) 0	5	10	14	18	22	26	30	34
30	27	22	290	275	240	190	110	--	--	--	--
40	34	29	700	685	650	600	520	410	210	--	--
50	40	35	1240	1225	1190	1140	1160	950	750	460	100
60	45	40	1820	1805	1770	1720	1640	1530	1330	1040	680

TABLE IV

ACCELERATION LANE LENGTHS BASED ON ACCELERATION RATE OF BUSES

Design speed mph	Pass. car running speed	Assumed truck running speed	Entrance curve design speed (mph) stop	-	10	15	20	25	30	35	40
			Assumed actual entrance speed (mph) 0	5	10	14	18	22	26	30	34
30	27	27	360	350	330	295	230	140	30	--	--
40	34	34	700	690	670	635	570	480	370	220	--
50	40	40	1220	1210	1190	1155	1090	1000	890	740	520
60	45	45	1820	1810	1790	1755	1690	1600	1490	1340	1120

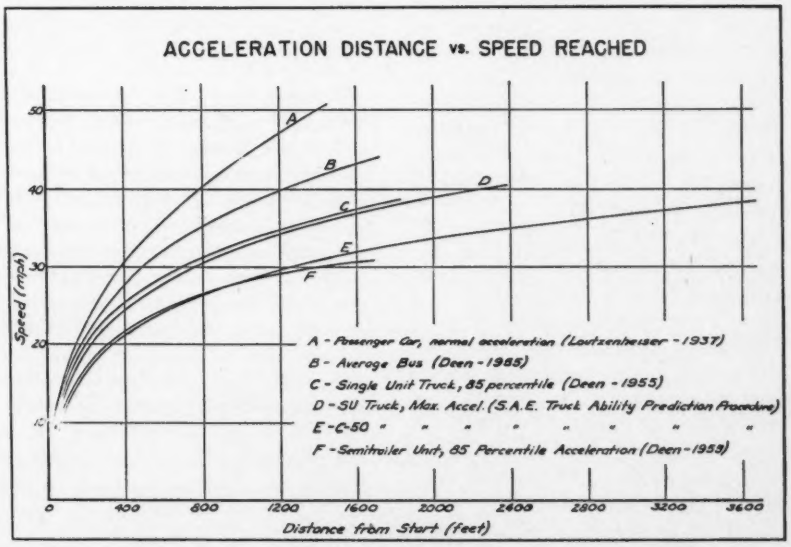
ACCELERATION DISTANCE vs. SPEED REACHED
Speed (mph)
Distance from Start (feet)
A - Passenger Car, normal acceleration (Loutzenheiser - 1937)
B - Average Bus (Deen - 1955)
C - Single Unit Truck, 85 percentile (Deen - 1955)
D - SU Truck, Max. Accel. (S.A.E. Truck Ability Prediction Procedure)
E - C-50 " " " " " " "
F - Semitrailer Unit, 85 Percentile Acceleration (Deen - 1955)

Figure 9

Acceleration lanes designed under current length standards are adequate for single unit trucks for all highway design speeds of fifty miles per hour or less and are adequate for semitrailer trucks for all highway design speeds of thirty miles per hour or less.

(Continued on page 236)

A Study of
A Bowser Mechanical Garage

Field Study Directed by
Robert L. Zralek
(Assoc. Mem., ITE)
Traffic Engineer, Chicago Bureau of Traffic and Parking

Reported by
Robert H. Burrage
(Assoc. Mem., ITE)
Head, Terminal Facilities Section, U. S. Bureau of Public Roads

This study is reported as an activity of ITE Committee 6A, Parking Garages. It is not a committee report, however. —EDITOR

THE FIRST MECHANICAL GARAGES appeared many years ago, but only since 1950 have better designs shown possibilities of meeting the requirements of speed, economy and efficiency needed to meet today's heavy parking demand.

At the time when this article was prepared, there were three new types or designs of mechanical garages in operation in the United States, and several others of apparent merit entering the field.

The first Pigeon Hole Garage opened in Spokane, Washington in December, 1950, and in 1955 there were 36 or more in use or under construction. An account of the operation of one of the earlier Pigeon Hole structures appeared in the August, 1954, issue of TRAFFIC ENGINEERING. The one Park-O-Mat garage, the only fully automatic or "push-button" garage in operation in the United States, opened in Washington, D.C. in December 1951, and is operating successfully.

The first Bowser garage went into operation in Des Moines, Iowa, in November, 1951, and by 1955 there were 14 or more in use, three of them in Chicago as a part of what is perhaps the most extensive and fastest moving parking program in the country. The first of those in Chicago, Facility No. 8, shown in Figure 1, is at 120 N. LaSalle Street, opposite City Hall, and is a 12-level structure with 11 levels for parking (each having 36 front-row and 9 back-row stalls) providing 495 parking spaces, plus a street-floor reservoir with space for 34 cars. It opened in October, 1954.

The Bowser-type garage is structurally similar to the Pigeon Hole, with two opposing tiers of parking bins, a central aisle, and an elevator which moves horizontally as well as vertically. While the elevator carries the automobile vertically, the whole elevator structure may be moved horizontally, so that one elevator can serve several vertical tiers of parking bins. But in other respects the two types differ. The Pigeon Hole elevator tower moves on ground-level rails, while that of the Bowser is suspended from above. The Pigeon Hole type has a mechanical dolly or device for loading and unloading the vehicle, while in the Bowser an attendant drives the cars on and off the elevator; because of this, the Bowser design can provide two-deep parking on one or both sides of the elevator shaft. The Pigeon Hole garage is operated with levers by an attendant riding the elevator platform, while the Bowser has push-button controls on the platform, operated by the car driver through the car window.

Figure 2 shows the layouts of the street floor and of a typical storage level in the Chicago Parking Facility Number 8, and this demonstrates an advantage of the two-deep layout. With the entire left-hand side of the ground level used for entrance purposes, it is possible to enter at the LaSalle Street front of the facility, drive through the reservoir area, and turn comfortably into any one of the 17 reception or loading stalls, while if this extra width was not available it would be necessary either to locate the structure on a corner parcel or to provide equivalent space at one side for approach access.

It will be noted that in this structure the stalls are at an angle of about 70° with the aisle. This was not due to the shape or dimensions of the site, nor does it give any saving in space, but it does have an important advantage in that it permits easier approach to the

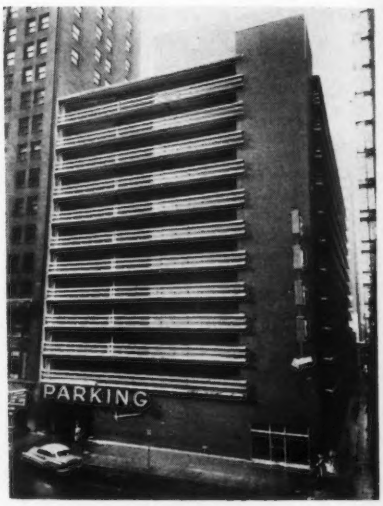

Figure 1
Chicago Parking Facility Number 8, at 120 LaSalle Street.

reception stalls and hence faster handling. On the exit side, which abuts an alley, departures are similarly facilitated. The four elevators are correspondingly skewed, each serving approximately one quarter of the stalls. Mechanical devices prevent any collision between elevators, but in an emergency it is possible for any elevator to enter the territory of an adjacent one. When it is desired to deliver a car stored in a rear-row stall, where the front-row stall is also occupied, it is necessary first to shift the front-row car to another location, a time-consuming operation, but the practise generally is to park two-deep only when necessary and to use the rear stalls as far as possible for long-time parkers.

Ticketing and Control

The location of cars in the garage and the ticketing are controlled by an ingenious electronic system, involving three panel boards, one in the reception area for the checker, one in the

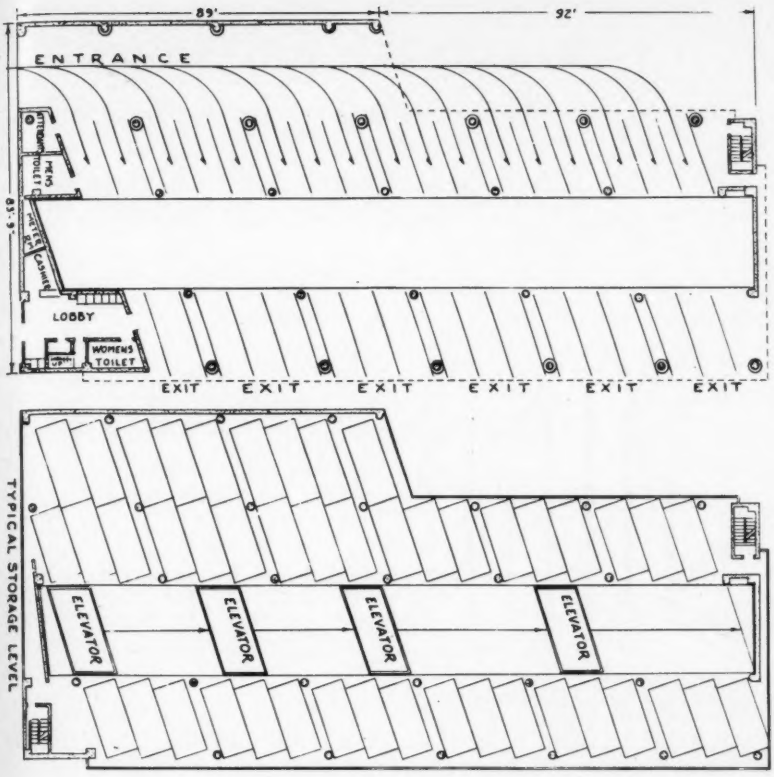

Figure 2
Plan of ground floor and typical storage level, Parking Facility Number 8.

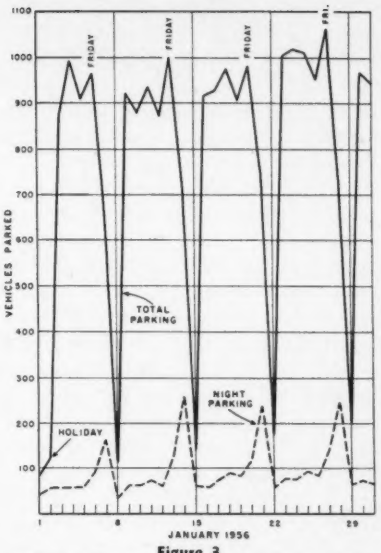

Figure 3
Parking usage pattern, Parking Facility Number 8.

elevator for the attendant, and one in the cashier's office; each panel has a light for each stall.

An arriving car is left by the owner in any vacant receiving space. The checker, guided by his control panel, selects an empty stall and writes its number on each section of a 3-part ticket. One part is given to the owner, one is sent by pneumatic tube to the cashier, and one remains with the car. The operator positions his elevator opposite the checked-in-car in the receiving space, then gets into the car and drives straight onto the elevator. He reaches through the car window, presses a button to close the gates, then presses the panel button having the number shown on the ticket stub left on the car.

The elevator moves vertically and horizontally simultaneously to the designated stall, the gates open, and the operator drives the car forward or backward into the stall. The operator then gets out of the car, walks back onto the elevator, and inserts the ticket stub into the proper panel pocket, and proceeds to the next pick-up or delivery. The insertion of the ticket stub into the panel pocket sets up an annunciator circuit for calling the car when the owner returns.

The office-stub of the ticket is inserted in the proper pocket in the cashier's panel, causing the related light on the checker's (reception) panel to show that that stall is occupied. When the owner returns and presents his claim stub, the office stub is removed from the panel. This causes the annunciator light in the elevator to come on, showing the operator which car is wanted, and cancels the corresponding light on the checker's panel.

When the operator gets an annunciator light, he presses the button under that light, thus dispatching the elevator to the proper stall. On the way to that stall, he removes the stub which was inserted when the car was parking, canceling the annunciator light. He then drives the car onto the elevator and delivers it to the ground floor, driving it off on the exit side, where the owner is waiting to receive it. When it is necessary to shift a front-row car to deliver a rear-row car, the operator shifts and remarks the panel board stub accordingly and notifies the cashier of the shift.

In its capacity as a public facility, Parking Facility Number 8 is open 24 hours a day, seven days a week. The rates are 65 cents for the first hour and 20 cents for each additional hour, with a 24-hour maximum of $1.95. It accommodates a small number of monthly patrons at $35.00 per month.

Table I. Average weekly usage pattern, January 1956.

	Number of parkers			Percent of	
	Day	Night	Total	Week's total	Average weekday
Average Sunday, holiday	70	53	123	2.2	12.9
" Monday	887	67	954	17.0	100.0
" Tuesday	862	66	928	16.5	97.2
" Wednesday	893	86	979	17.4	102.5
" Thursday	835	73	908	16.2	95.1
" Friday	885	119	1,004	17.9	105.3
" Saturday	492	226	718	12.8	75.2
" week	4,924	690	5,614	100.0	
day of 5-day week			955		
day of 7-day week			802		

The Weekly Pattern

The usage of this facility for the month of January, 1956, is shown graphically in Figure 3, and by the data in Table I. It will be noted that

Friday gets the peak usage, while Saturday evening has more than double the usage of the average evening. However, there was practically no difference found in the total daytime usage for the five weekdays, Monday through Friday.

The Daily Pattern

Figure 4 shows the arrival and departure pattern and the accumulation curve at this facility for a typical midweek day, when the total volume parked was 856, a turnover of 1.75. It will be noted that the curve representing the total number of vehicles handled (INS plus OUTS) follows quite closely the accumulation pattern. That is, the greatest amount of work to be done comes at the time when the garage is most nearly full and not necessarily at the period of greatest influx.

Parking Durations

Table II compares the arrival pattern with the length of time parked. The average duration was 3 hr. 13 min. and about 60 percent parked for less than three hours.

Operating Performance

On April 25, 1955, the Chicago Bureau of Street Traffic and Parking (L. J. Sorenson, City Traffic Engineer and W. R. Marston, Deputy Traffic Engineer) made a comprehensive study of the Parking Facility Number 8, using a crew of 12 observers under the direction of Robert L. Zralek, Traffic Engineer. On this day, between 9 A.M. and 5:15 P.M., 830 cars were parked, 719 were unparked, and the maximum accumulation was 328, or 66 percent of the garage capacity, shown graphically in Figure 5.

During this period every car was timed upon its arrival in the street, its arrival in the reception reservoir, and

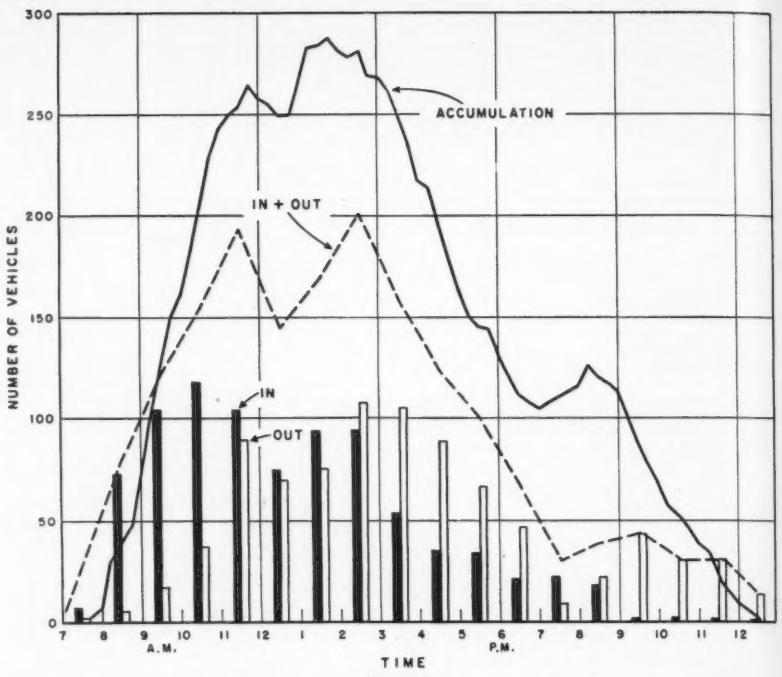

Figure 4
Arrivals, departures and accumulation, Parking Facility Number 8, February 2, 1956 (Thursday).

Table II. Time of arrival and duration of parking 1/

Hour of arrival	Duration of parking												
	Under 15 min.	16-30 min.	31-60 min.	1-2 hours	2-3 hours	3-4 hours	4-5 hours	5-6 hours	6-7 hours	7-8 hours	Over 8 hours	Total	Percent
Before 7 a. m.			1	1								2	0.2
7-8					1	1				1	4	7	0.8
8-9	1		7	9	6	6	5	5	2	4	28	73	8.5
9-10	2	3	3	21	15	9	9	4	9	7	22	104	12.1
10-11	3	5	18	36	10	16	10	4	2	6	8	118	13.8
11-12	7	11	15	22	16	15	6	5	3	1	3	104	12.1
12-1 p. m.	2	5	8	19	17	10	7	2	1	1	3	75	8.8
1-2	5	7	17	29	14	11	7	3	1			94	11.0
2-3	4	8	14	26	21	11	3	1	1	3	1	93	11.0
3-4	5	6	12	16	5	2	3		2	1	2	54	6.3
4-5	3	5	6	6	6	2	1	3	1	1	1	35	4.1
5-6			4	3		13	8	3	2		1	34	4.0
6-7				2	2	6	9	2				21	2.5
7-8				4	7	7	3	1				22	2.6
8-9				1	4	11	1	1				18	2.1
After 9 p. m.						1						1	0.1
Total	32	50	105	195	124	121	72	34	24	25	73	855	100.0
Percent	3.8	5.8	12.3	22.8	14.5	14.1	8.4	4.0	2.9	2.9	8.5	100.0	
Accum. percent	3.8	9.6	21.9	44.7	59.2	73.3	81.7	85.7	88.6	91.5	100.0		

1/ February 2, 1956.

Average parking duration 3 hours 13 minutes.

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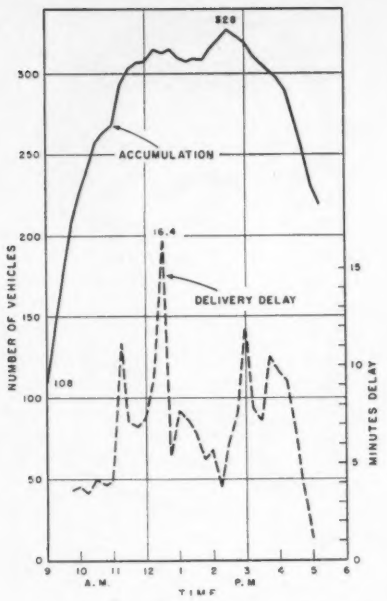

Figure 5
Parking accumulation and delivery time, Parking Facility Number 8, April 25, 1955.

at the moment when the driver received a ticket and was free to leave. These times are shown in Table III.

For departures, each driver was timed upon arrival in the waiting line, arrival at the cashier's window, departure from the cashier's window, and at the moment of car delivery. These times are shown in Table IV.

The variation of the extent of delay in delivery through the day is shown by the lower curve in Figure 5, and it will be noted that this curve in general follows the accumulation curve. That is, the greatest delays normally occur at the times when the garage is most heavily occupied — which are also the periods of maximum movement (INS plus OUTS).

Additionally, each individual elevator trip was classified as to type of operation and was timed. These times are shown in Table V.

There is no direct relation between the elevator times shown in Table V and the "lobby times" shown in Table IV, which include any delays while the operator handles previous calls. The elevator times shown in Table V represent elapsed times between the elevator's departure from ground level and its return thereto.

It will be noted that between 9 A.M. and 5:15 P.M. it took 979 trips to store 830 cars and deliver 719 cars, only 58 percent of the trips being "dual" (handling both a storage and a delivery).

Table III. Arrival delays.

	Minimum	Maximum	Average
Street waiting time	——	166.0 secs.	47.5 secs.
Internal time	17.2 secs.	32.8 secs.	20.6 secs.
Total time	20.6 secs.	187.8 secs. (3 min.)	68.1 secs. (1 min.)

Table IV. Departure delays.

	Minimum	Maximum	Average
Waiting line	——	272.3 secs.	41.1 secs.
Cashier's window	18.4 secs.	62.0 secs.	25.3 secs.
Lobby time	69.8 secs.	682.5 secs.	335.0 secs.
Total time	89.7 secs. (1.5 min.)	986.5 secs. (16.4 min.)	399.9 secs. (6.7 min.)

Table V. Elevator times.

	No. of trips	Percent	Average time
Type A (storing one car and returning empty)	264	27.0	63.3 sec.
Type B (going up empty and delivering one car)	148	15.1	60.1 sec.
Type C-1 (storing one car and delivering a car from an opposite stall, requiring no extra elevator movement)	18	1.8	87.3 sec.
Type C-2 (storing one car and delivering another, involving an elevator shift)	549	56.1	100.4 sec.
Type C-3 (storing one car and delivering another, the delivery involving shifting a front row car to get at a rear-row car)	0[1]	0	—
Total number of trips	979	100.0	84 sec.

[1] The peak accumulation of 328 did not require the use of two-deep parking.

The average *arriving* customer was free to leave in slightly over one minute, and the maximum delay was about three minutes, this expeditious handling being ascribable largely to the 34-car reservoir space. But the reservoir space does not directly facilitate deliveries, and the average wait or delay in delivery was 6.7 minutes. Between 12 and 1 P.M. the average delay was 9.75 minutes and between 3 and 4 P.M. it was 8.8 minutes. This was on a day when the peak occupancy was only 66 percent of capacity and no two-deep parking was necessary.

It is of interest, therefore, to consider the performance which might be expected if this garage were to reach its capacity occupancy of 495 cars. When studied, the peak occupancy was 328, enough to fill 9 of the 11 levels using one-deep parking. Using the same arrival pattern but expanding the volume to produce a peak accumulation of 495 would mean parking 1,254 cars between 9 A.M. and 5:15 P.M., requiring 1,447 trips. The average trip would be for 5.5 levels instead of 4.5 levels, and would require 10 seconds longer, so far as elevator travel is concerned.

At the time of peak movement (or greatest delay), or 12-1 P.M., the occupancy would be 476, or 119 per average elevator, and there would be 38.5 INS and 38 OUTS per average elevator. Under the most favorable conditions the average elevator would have 99 cars in front stalls and 20 in rear stalls. Thus one sixth of the cars would be in rear stalls, and the odds, statistically, would be that about one-half, or 9.5 of these would be blocked when called for. It will be noted from Figure 2, however, that the rear-row stalls are not evenly distributed through the garage, and the actual distribution is:

Elevator	Front row	Rear row	Total
#1	88	33	121
#2	88	44	132
#3	88	22	110
#4	132	—	132
	396	99	495

Thus among the four elevators the range is from no rear-row cars to one-third rear-row cars. Making an allow-

(Continued on page 236)

A New Traffic Delay Measuring Device

by Lionel Montgomery Rodgers
Automatic Signal Co.,
East Norwalk, Connecticut

A PRIME OBJECTIVE of any traffic control operation is to pass safely the vehicles presenting themselves at a point of conflict with a minimum of total delay. For the traffic engineer to achieve this objective requires that in some manner he can know the delay incurred by the vehicles at the point of conflict for various adjustments of the traffic control system and under various load conditions.

With single dial, fixed time equipment the basic objective expressed above must often be modified in the interest of preventing the back up of peak traffic. With multi-dial, fixed time equipment, delay for each of several traffic conditions can be minimized and a better approximation can be made to reducing total delay to a minimum, while still meeting maximum demand. However, the adjustment of even multi-dial controllers to obtain minimum total delays is difficult without accurate and comprehensive time and delay information. With actuated equipment, particularly that of the density type—which if properly set is capable of providing substantially the minimum total delay for any traffic load—an even greater amount of quantitative information is required as to the dial settings versus the total vehicle delays which will occur for all traffic loads in order to enable the traffic engineer to get the maximum efficiency out of this type of equipment.

When the need arose in Philadelphia to make comparative tests to determine the type of control equipment which would give minimum intersection delay at certain difficult intersections, it was felt that more data was needed than could be obtained by any of the methods developed in the past for measuring intersection delay. It was felt that what was needed for the quantitative measurements necessary was equipment which could make use of relatively unskilled operators, which would provide a permanent record of the intersection operation, the number of vehicles delayed and their total time of delay and which could utilize standard commercial recording equipment.

An article by Donald S. Berry and Cecil J. Vantil, which appeared in TRAFFIC ENGINEERING in December 1954, titled "A Comparison of Three Methods for Measuring Delay at Intersections" compares three methods of measuring intersection delays: (1) the ITTE delay meter; (2) the sampling method; and (3) the spaced serial photo method. All of these methods require skilled and well trained operators for accurate results.

The presently described equipment takes an approach similar to that of the ITTE type meter, but requires considerably less skill on the part of the personnel using it, and automatically provides a full permanent record of the time of arrival of vehicles, the maximum delay on red, and the operation of the signals, as well as the total delay on red.

The equipment which was designed for use in Philadelphia is believed to provide the quantitative data needed by a traffic engineer to set accurately any type of traffic control equipment to give a minimum of vehicle delay at an intersection.

It was initially decided that the operator or operators should have to do nothing more than to push an elecrical push button for each stopped vehicle on the red signal and that all other operation of the equipment would be strictly automatic. While in the equipment which was actually built, used, and described here, a compromise was made in that the resetting of the recorder on each change of the lights was a manual operation, little change is needed to make the equipment fully automatic.

The theory of this equipment hinges around a double integration process performed by (a) an electronic circuit, and (b) a planimeter on the chart of a recording voltmeter. The actual voltage recorder used was a Leeds and Northrup Speedomax G self balancing potentiometer with the chart geared to a speed of 3.66 inches per minute. The position of the pen of the Leeds and Northrup Speedomax G is a direct function of the voltage applied to the input terminals, and the time required for balance is a fraction of a second. The circuits supplying the input voltage of the recorder, which will be described more completely later were so arranged that on the beginning of a red period for one of the streets, the pen of the recorder would always be reset to a fixed position and if no further action were taken, would draw a straight line which would indicate zero vehicle delay.

In operation, as each car arrives at the red signal, the operator presses the button. For each time the button is pressed, a discreet increase in voltage occurs at the terminals of the voltage recorder, thereby causing the pen to move a fixed incremental distance across the chart. If N cars arrive on the red signal, the pen deflects N units across the chart by virtue of the push

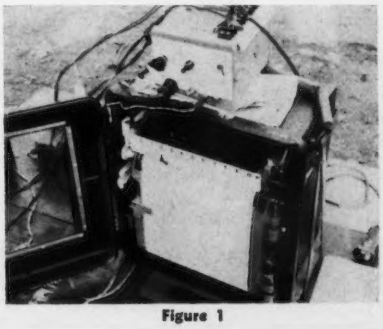

Figure 1

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button having been pressed N times. When the signal turns green, the pen is caused to be restored to its initial position. The area between the base line and the curve drawn by the pen is then a direct function of the number of vehicle seconds of delay on the red signal. Using for the starting time of stopped vehicles the applicable figures from Dr. Greenshield's data, it is then possible to obtain the total delays to vehicles on the red signal. The area under the curve drawn by the pen represents total delay on the red and can be later measured using a standard planimeter.

As soon as the signal turns red on the second street, the recorder is prepared to receive information from the operator stationed on that street and again when the signal turns green on the second street, the pen returns to its initial position. Thus the only action required by the operators is to press the push button each time a vehicle stops at the intersection. The apparatus in use in the field is shown in Figure 1.

The form in which the information was recorded is shown in Figure 2, which is a facsimile of a section of the recorder chart copied to provide better photographic reproduction. It will be noted that the vehicle steps are larger on the one street than on the other. This difference is the result of a built in sensitivity changer which automatically compensates for the differences in the number of lanes between the two streets being tested. In the case of the test shown on the recorder chart of Figure 2, the one street has twelve lanes and the second street four lanes. Had the same recorder sensitivity been used with both streets, the number of vehicles arriving on the 4-lane street was so much lower that the pen would have moved such a small distance along the paper that very little accuracy could have been obtained.

Figure 3 shows the overall wiring diagram of the integrator unit which supplied the voltage to the recorder. This unit employs a 6BA6 pentode type vacuum tube with a 3 ohm cathode load, shunted by a 10 ohm potentiometer, the arm of which was connected to the input of the Leeds and Northrup recorder.

The voltage drop across the 3 ohm resistor determines the movement of the potentiometer needle across the chart. The voltage drop is determined

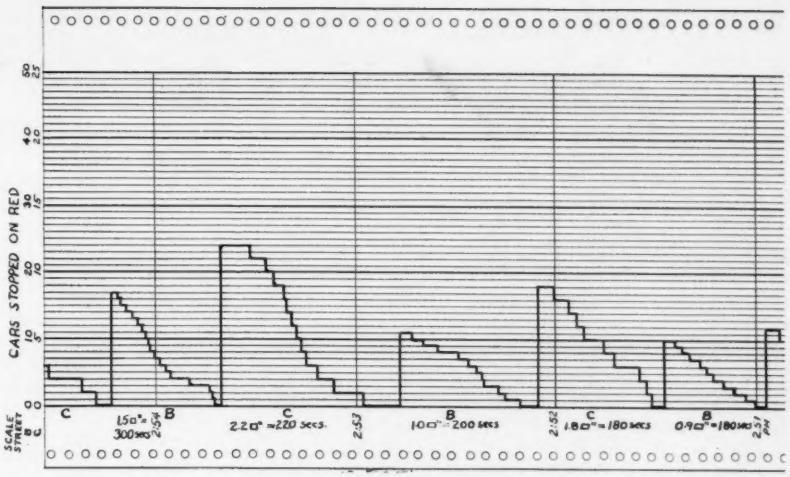

Figure 2
Recorder Chart Section.

by the amount of current flowing through this resistor. The current flow is in turn determined by the plate resistance of the 6BA6 tube, which plate resistance varies directly with the bias voltage applied to the grid of this tube. Condensers of relatively large value; i.e., either 1 microfarad or 2 microfarad, depending upon the range setting of the instrument, are used in the grid circuit of the 6BA6. When the signal changes, operation of a key switch of the equipment described or a relay in the fully automatic version causes the grid condenser to be charged to the relatively high negative potential. This reduces the plate current of the tube to a minimum and establishes the zero setting of the recorder. Each time one of the push buttons on the red street is pressed, the appropriate relay operation causes a fully discharged .05 microfarad condenser to be connected across the grid condenser in the tube circuit. This removes part of the charge from the grid condenser, and thereby lowers the grid voltage on the tube, increasing both the plate current and the voltage drop across the 3 ohm cathode resistor. This in turn causes the pen of the recording potentiometer to move up scale by a predetermined amount.

The nature of the circuit shown and described is such that each successive push button actuation causes a smaller voltage change on the grid condenser. Unless compensation were provided, this would result in a smaller per vehicle movement of the pen as more and more vehicles arrived at the intersection. However, the nature of pentode vacuum tubes is such that this effect can be easily compensated for by placing a proper sized resistor in the screen grid connection to the vacuum tube. In the circuit shown, a 20,000 ohm variable resistor in series with a 30,000 ohm fixed resistor was

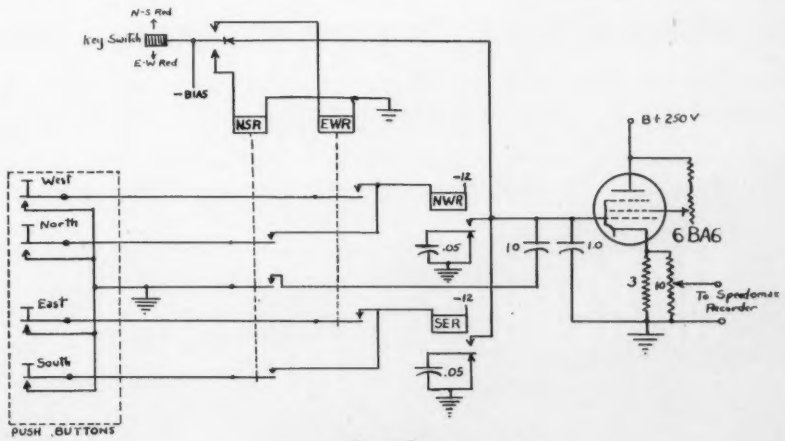

Figure 3
Integrator Schematic.

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SUMMARY OF DELAY STUDY

TEST No. 16 — 3-11-55 — 4-6 P.M. — 68° CLOUDY

	Approach	VOLUME EB or NB	VOLUME WB or SB	Number Vehicles Stopped	DELAY — SECONDS Stopped on Red	DELAY — SECONDS Starting on Green	DELAY — SECONDS Total	Average Delay / Stpd. Veh.	Average Delay / All Vehs.	Percent Vehicle Stopped	Total Volume	Number Vehicles Stopped	DELAY — SECONDS Stopped on Red	DELAY — SECONDS Starting on Green	DELAY — SECONDS Total	Average Delay / Stpd. Veh.	Average Delay / All Vehs.	Percent Vehicles Stopped
4:15	Blvd.	458	601	391	5331	2845	8176	21.0	7.7	37.0	1416	572	8761	4602	13363	23.4	9.5	40.5
4:15	Cottman	169	188	181	3430	1757	5187	23.4	9.5	50.5								
4:30	Blvd.	431	481	445	6263	3150	9413	21.2	10.3	48.7	1274	624	9973	4943	14916	24.0	11.7	48.9
4:45	Cottman	217	145	179	3710	1793	5503	30.9	15.3	49.5								
4:45	Blvd.	590	622	435	8178	3375	11553	26.0	9.5	35.8	1586	669	13823	6075	19898	29.8	12.5	42.2
5:00	Cottman	193	181	234	5645	2700	8345	35.6	22.3	62.6								
5:00	Blvd.	522	377	565	9785	5543	15328	27.1	17.1	63.0	1186	817	15685	8704	24389	29.8	20.5	69.0
5:15	Cottman	176	111	252	5900	3161	9061	36.0	31.6	87.8								
5:15	Blvd.	667	536	475	6828	4034	10862	22.9	9.0	39.5	1590	703	12068	6616	18684	26.6	12.7	44.2
5:30	Cottman	203	184	228	5240	2582	7822	34.3	20.2	59.0								
5:30	Blvd.	489	242	337	5467	2345	7812	23.2	10.7	46.0	1002	560	11037	4797	15834	28.3	15.8	55.8
5:45	Cottman	179	92	223	5570	2452	8022	36.0	29.6	82.5								
5:45	Blvd.	648	348	385	4997	2720	7717	20.0	7.8	38.7	1330	601	9247	4894	14141	23.7	10.6	45.2
6:00	Cottman	151	183	216	4250	2174	6424	29.7	19.5	64.7								

Figure 4

used in the screen grid circuit and this resulted in a substantially constant movement of the pen for each vehicle from zero to full scale.

One further detail of the circuit used is believed worthy of note. With an operator on each of the two approaches on a given street, it was possible to put the two push buttons involved in paralel. However, if this were done as the density of the vehicles increased, the chance of coincident operation of the two buttons by the two operators with resultant loss of counts also increases. This inaccuracy was avoided by providing two separate relays with separate .05 μf condensers, one for each operator. This circuit design serves the purpose of avoiding reduction in apparent count as densities increase, and also avoids inaccuracy due to an operator holding his push button closed for longer than a momentary time. Other details of the circuitry are apparent from the wiring diagram.

In addition to the data obtained by this recorder, it is also necessary to obtain full counts during the period of the delay measurements. Mechanical counters are provided in each of the approaches to the intersection under test and the time shown of these counters is coordinated with the chart data from the recorder. Since the speed of the recorder chart is very accurately known, the exact time of the changing of the signals from one phase to the other can be directly determined.

Referring again to Figure 2, each of the areas representing delay on the red signal is planimetered and a direct conversion is possible to vehicle seconds of delay since the area planimetered directly represents delay on the red.

Figure 4 shows the tabular setup that was used to record the data. By taking this type of data on a number of successive days with different types of control equipment, it is possible to correlate directly in a fully quantitative fashion the effect of the changes made in control equipment and vehicular delay.

The Speedomax G recording potentiometer used in making the chart of Figure 2 was supplied through the courtesy of Mr. E. E. Pearson of the Leeds and Northrup Company, Philadelphia, Pa. The tabular arrangement of data shown in Figure 4 was devised by Mr. Bruce Murray of the Traffic Engineering Section, Department of Streets, Philadelphia, Pa.

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Traffic News

The Theodore M. Matson Memorial Fund is established at Yale University, as Merwyn A. Kraft (second from right) presents a $4,500 check to Treasurer Charles S. Gage of Yale University. The presentation was made last month (December 27) at a dinner meeting at the Yale Faculty Club. Others shown are Nathan Cherniack (left), Fund treasurer, and Fred W. Hurd, Fund secretary; Mrs. Theodore M. Matson, and her daughter, Mrs. William Woodcock.

Matson Award Plans Announced

An annual award citation to the individual who makes the greatest scientific contribution to highway traffic knowledge is provided under the Theodore M. Matson Memorial Fund recently established at Yale University.

The fund also provides for financial aid to students enrolled at the Yale University Bureau of Highway Traffic. This will be made on a loan basis.

The Fund honors the late director of the Bureau of Highway Traffic who died December 15, 1954. The Fund consists of contributions made by individuals in the traffic engineering field to commemorate Mr. Matson's outstanding achievements and his sincere devotion to the training of young engineers in the field of highway traffic operations. The initial amount presented to Yale last month totaled $4,500. Of that, $2,000 will finance the annual award. The remainder, which may be increased from time to time by additional contributions, will be used for student aid. This is to be administered by the Yale University Committee on Transportation.

The annual award, to be inaugurated this year, will be made by a Board representing the Committee on Transporation, the Institute of Traffic Engineers, the American Association of State Highway Officials, the Highway Research Board of the National Research Council, the United States Bureau of Public Roads and the Automotive Safety Foundation.

Selected on a national basis, award recipients will receive a plaque and will present a technical paper at a national highway or traffic meeting.

Mr. Matson was a pioneer in the field of highway traffic engineering and served the profession as a national authority, teacher, and leader in highway safety and operations research.

Thirty-eight national highway traffic leaders are members of the newly-formed Theodore M. Matson Memorial Fund Corporation, 301 Strathcona Hall, New Haven, Connecticut. Officers of the Board of Trustees are Merwyn A. Kraft, President; Burton W. Marsh, vice president; Fred W. Hurd, secretary; and Nathan Cherniack, treasurer. Mr. Kraft is research coordinator of Flight Safety Foundation, Inc. in New York. Mr. Marsh is the director of the Traffic Engineering and Safety Department of the American Automobile Association in Washington, D.C. Mr. Hurd is the present director of the Bureau of Highway Traffic at Yale, and Mr. Cherniack is transportation economist of the New York Port Authority.

Other members of the Board of Trustees are Joseph E. Havenner, director of Engineering and Technical Services, Automobile Club of Southern California; D. Grant Mickle, director of Traffic Engineering Division, Automotive Safety Foundation in Washington, D.C.; F. Houston Wynn, associate traffic engineer, Wilbur Smith Associates in New Haven; Theodore W. Forbes, program director of American Institute for Research in Pitssburgh; and Paul L. Green, sales manager of the Automatic Signal Division in East Norwalk, Connecticut.

At a ceremony held at the Yale Faculty Club, the checks establishing the Award and Loan Funds were presented by Mr. Kraft to Charles S. Gage, treasurer of Yale, in the presence of Mrs. Theodore M. Matson and her daughter, Mrs. William Woodcock.

National Safety Council Offers Citation Awards

The National Safety Council has announced that it will again offer Citation Awards, recognizing traffic safety activities by non-professionals in the field.

Entries must be submitted on official forms, obtainable from the Council, 425 N. Michigan Avenue, Chicago 11, Illinois. Awards will be made to organizations and to individuals as long as they do not have professional responsibility in the field of safety. Awards will be based on leadership in the field, a sustained and continuous interest in traffic, cooperation with officials and official groups, and activities that result in stimulation of others, improved coordination and action, or legislation for safety. Finally, entries will be judged on the adaptability of the method to other groups and situations.

Awards will be announced May 6, but the deadline for submitting entries is February 28.

Oregon Tourists

A study in the State of Oregon estimates that 1,900,000 out-of-state cars entered the state during 1956. Each car carried an average of 3 persons, who spent an average of $74 per car in Oregon.

Interviews of drivers showed 54 per cent preferred motels, 18 per cent stayed with friends, 4 per cent went to hotels, 8 per cent camped, 3 per cent used house trailers and 13 per cent did not use any housing facility in the state.

Purdue Schedules Transportation Research Symposium

A Transportation Research Symposium has been announced by Purdue University for February 27 and 28.

This symposium has as its purpose to present the most recent results of management science research in its application to all phases of the transportation industry. It is intended to emphasize and balance in presentation both the point of view of practical operations and the point of view of method or "management science" innovation. It will attempt to stimulate the transfer of ideas developed in one type of transport operations to others. Finally, the symposium will strive to develop a feeling of fellowship among leaders in transport management and in management science research.

The program is sponsored jointly by the Institute of Management Sciences, the Operations Research Society of America, and the American Institute of Industrial Engineers. For further information, address Professor A. Charnes, Director of Research, Department of Industrial Management and Transportation, Purdue University, Lafayette, Indiana.

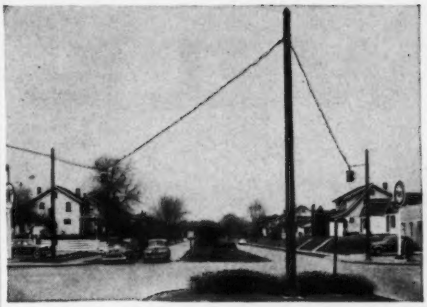
Wisconsin Plans Institute Feb. 19-20

The Fourth Institute on Traffic Engineering will be held at the University of Wisconsin on February 19-20, 1957. This Institute is sponsored by the State Highway Commission of Wisconsin and the University of Wisconsin.

The course is aimed at improving traffic conditions in cities and communities of Wisconsin. Subjects to be covered include:

- Intersection design
- Street layout
- Subdivision layout from traffic engineering viewpoint
- Some interesting solutions to traffic problems
- Public transportation in traffic planning
- Speed control
- Zoning for parking
- New ideas in pedestrian and vehicular signals at intersections

The registration fee is $15. Information concerning registration may be obtained from the Institute Coordinator, Professor Leonard F. Hillis, University Extension Division, University of Wisconsin, Madison 6, Wis.



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Union Metal tapered steel poles, plain round or fluted . . . the most practical, economical solution to your traffic signal support problems. Available for either mast arm, suspension or pedestal type signals. For catalog information write to The Union Metal Manufacturing Company, Canton 5, Ohio.

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for modern traffic control

On today's high-speed highways, signs that can be read at a glance are essential. To provide a simple, lasting means for mounting such signs, Union Metal developed Monotube Overhead Sign Supports, which have already proved their effectiveness and economy in numerous installations.

These steel supports offer the same outstanding design, strength and construction features for which Monotube street lighting, floodlighting and strain poles have long been noted. Send for catalog data today. Address The Union Metal Manufacturing Company, Canton 5, Ohio.

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Dual, the nation's oldest and one of the world's largest manufacturers of parking meters has become a division of Rockwell Manufacturing Company. This new corporate team means that there are even more reasons why Dual will continue to be your best parking meter buy.

Today, hundreds of thousands of Dual parking meters are used in hundreds of U. S. and Canadian cities. Testimony to their exceptional performance and operating economy is the fact that five of the six American metered cities with a population over one million are operating Dual meters. Since the first Dual parking meters were installed in Oklahoma City in 1935 (the nation's pioneer installation), Dual has continued to be the leader of the parking meter industry.

Now, you can expect *even greater* benefits from Dual parking meters. The reason: Rockwell research combined with Dual's engineering and manufacturing leadership. For more than half a century, Rockwell has been one of the world's largest and leading manufacturers of measurement devices. Whether measuring in units of time, distance, money or flow, there are many closely related problems. The five Rockwell Research and Development Centers have unmatched know-how experience plus the most advanced technical facilities to solve these problems. The over-all objective —develop products that work better, last longer and cost less to use.

No matter what your parking meter needs, there is a Dual that will assure greater income at lower investment for your community. Write today for complete details and the name of your nearest Dual representative. Dual Parking Meter Company, Division of Rockwell Manufacturing Company, Pittsburgh 8, Pa.

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DUAL

PARKING METERS

Yale Announces Traffic Engineering Fellowships and Scholarships

An increased number of fellowships and tuition scholarships in Traffic Engineering at the Yale Bureau of Highway Traffic will be available for the academic year starting in September, 1957. Students must be graduate engineers from accredited colleges to qualify for enrollment.

The Yale University Committee on Transportation awards fellowships on a competitive basis to applicants who are residents of the continental United States. All fellowships offer $2,000.00 each which provides tuition and a living stipend of $175.00 each month during the academic year. The fellowships will be similar to those awarded last year as described below:

Automotive Safety Foundation Fellowships—Applicants should have had practical experience in city or state highway engineering, or in related fields. Preference will be given to those applicants who are now employed in street and highway engineering and who secure a leave of absence in order to return to their present employer.

Esso Safety Foundation Fellowships — Candidates for these fellowships must be citizens of the following states: Maine, Vermont, Rhode Island, New Hampshire, Massachusetts, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, West Virginia, North Carolina, South Carolina, Tennessee, Arkansas, Louisiana and the District of Columbia.

The James S. Kemper Foundation Fellowship—This fellowship is not restricted to any particular group or region but is available for professionally qualified men desiring to pursue the profession of traffic engineering.

Liberty Mutual Fellowship—Applicants for this fellowship must show evidence of aptitude and interest in traffic engineering. It is not required for them to have entered the practice of traffic engineering.

The Committee on Transportation also awards tuition scholarships to deserving students. These awards do not provide living stipends. Special consideration will be given qualified applicants who receive living stipends from their employers while in school. The course has been approved by agencies providing financial aid to veterans and foreign students.

Applications for admission and special forms for fellowship application may be obtained by writing to the Director, Bureau of Highway Traffic, Yale University, Strathcona Hall, New Haven 11, Connecticut. The closing date for filing fellowship applications is March 1, 1957.

M. S. U. to Hold Short Courses

Two traffic engineering short courses will be held on the campus of Michigan State University in March, 1957. The first short course pertaining to parking problems and their solutions is planned for March 11-12, and the second short course pertaining to the application of traffic engineering principles in rural areas is planned for March 14-15, 1957. These two courses are being sponsored jointly by the Highway Traffic Safety Center and the College of Engineering.

The first short course in traffic engineering was held at Michigan State University October 17-20, 1956 and fifty-one persons attended this course. The purpose of this course was an introduction to traffic engineering and included the fundamentals of traffic engineering principles.

It is anticipated that additional traffic engineering courses and conferences will be held on the campus of Michigan State University and in other communities in the state of Michigan in the future.

Those interested in attending either of the short courses planned for March, 1957 should write to the Traffic Engineering Course Director, Highway Traffic Safety Center, Michigan State University, East Lansing, Michigan.

Engineering Awards Announced by ASEE

Seven national awards in engineering education will be given by the American Society for Engineering Education at its 1957 Annual Meeting at Cornell University, June 17-21.

Competitions for all the awards are now open, and nomination blanks are ready, according to Professor W. Leighton Collins, Secretary of the Society.

The seven awards are:

1. The Lamme Award, given annually to an engineering educator for distinguished achievements contributing to the advancement of the profession. This is the Society's oldest award and its highest honor.

2. The George Westinghouse Award, an annual $1000 prize for distinguished contributions to teaching engineering students. The Westinghouse Award is especially intended to encourage younger men who show superior teaching ability.

3. The Vincent Bendix Award, a gold medal given annually for top achievement in engineering research in colleges and universities. It is to recognize contributions through original research of others, and the effective application of research results to the advancement of engineering education.

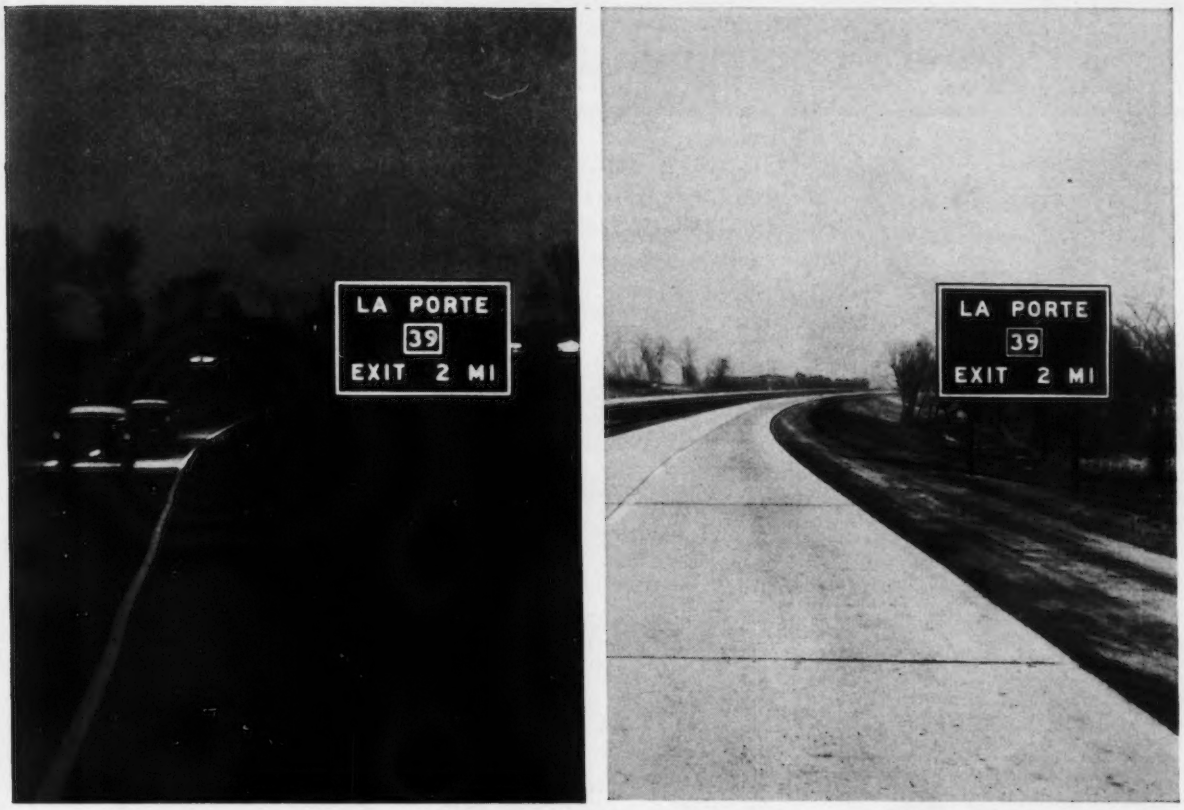
4. The Curtis W. McGraw Research Award to honor young staff members for contributions through engineering college research. This $1000 prize, to be given for the first time next year, is to recognize outstanding early research achievements and to encourage the continuance of such activity in the future.

5. The James H. McGraw Award In Technical Institute Education is an annual prize of $500 presented for established achievement in technical institute education — teaching, administration, publications, and other forms of leadership.

6. The President's Awards to Young Engineering Teachers, given annually for papers written by young engineering teachers on a phase of engineering education. Prizes of $200 and $100 are given for the two top-ranking papers.

7. The Engineering Drawing Award of a certificate for distinguished service by a member of the Society's Engineering Drawing Division. The qualifications include a record of successful teaching, improvement of the tools and conditions for teaching, scholarly contributions to engineering drawing, and service to the Division.

The Society's awards are given to winners selected, in each case, by special committees assigned to study the records of each nominee. Further information and blanks for nominations are available from Professor W. Leighton Collins, Secretary of the Society, at the University of Illinois, Urbana, Illinois.



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New Appointments

Ecker Leaves Washington To Enter Consulting Field

John B. Ecker (Mem., ITE) has accepted a position as Senior Engineer with W. C. Gilman & Co., 55 Liberty Street, New York 5, N. Y. and will move to the New York area. Ecker, a past member of the Board of Directors of the Institute from District 2 lived in the Washington, D.C. area and was past president and active in that local section.

John B. Ecker

For twenty-seven years he was connected with the Capital Transit Company and its predecessors in various capacities, among which were Director of Research & Planning, Assistant to the President & General Manager. At the time the company sold its assets to D. C. Transit System Inc. in August, 1956, he was Vice President and Director.

Ecker stayed on with the D. C. Transit System Inc. as Vice President-Operations but resigned in early October of this year.

The W. C. Gilman & Co. is an independent firm of engineers and financial consultants specializing in the utility field and conduct studies and recommendations related to transit systems, highway traffic and earning estimates for toll facilities and parking installations, etc.

A graduate of Washington & Lee University, Ecker did street traffic research in 1928 at the Albert Russell Erskine Bureau at Harvard University, a predecessor of the Yale Bureau of Highway Traffic. He later did additional work in law and business administration at National University and George Washington University. He is a registered Professional Engineer in Maryland and the District of Columbia.

Barriere Named Deputy Director of Montreal Traffic

Jacques Barrièe (Assoc. Mem., ITE) has been recently appointed Deputy-Director of the Montreal Traffic Department. He had previously been in charge of the Traffic Survey Section in the same Department since 1954.

Barrière is a graduate civil engineer from Montreal Polytechnique, 1950.

Jacques Barrière

The following year, he won the first Fellowship awarded to Canada by the International Road Federation. In 1952, he completed the traffic course at the Yale Bureau of Highway Traffic.

Before joining the Traffic Department, he worked successively for the Public Works and the City Planning Departments of Montreal.

He is a member of several societies in addition to the Institute of Traffic Engineers, namely the Canadian Good Roads Association, the Ontario Traffic Conference and the Canadian Highway Safety Conference. He still finds time to be involved with the Joint Committee on Uniform Traffic Control Devices for Canada.

BOWSER GARAGE

(Continued from page 222)

ance for intelligent planning in the storage of cars, whereby long-time parkers would so far as possible be placed in rear-row stalls, it appears to be reasonable to assume that for the 20 rear-row cars served by the average elevator, 4 would be blocked when called for, necessitating the prior shifting of a front-row car to another space.

Assuming the most favorable conditions, the peak hour movements for the average elevator would involve:

38 dual trips at 100.4 + 10 secs.	4195.2 secs.
0.5 IN trips at 63.3 + 10 secs.	36.6 secs.
Plus 4 moves of front-row cars at 60 secs.	240.0 secs.
Total time required	4471.8 secs.

or 4471.8/38.5 or 116 secs. per trip. This obviously could not be done in the 3,600 seconds available in one hour, and it would be possible to make only 3,600/116 or 31 trips.

The present average elevator serves 124 stalls, and during the peak period, when operating at only two-thirds capacity, there were delivery delays up to 16 minutes. It would appear that to meet capacity loading and to eliminate delivery delays, design should not require the average elevator to serve more than 31/38.5 x 124 or 100 stalls.

The design data on the Parking Facility Number 8 show the elevators as having a vertical speed of 250 FPM and a horizontal speed of 150 FPM. Some more recent installations of similar equipment have corresponding speeds of 400 and 100 FPM, but no data are available on the net effect on handling speed.

ACCELERATION LANE LENGTHS

(Continued from page 217)

Design of acceleration lanes based on the acceleration characteristics of the assumed SU or C-50 design vehicles as determined from the Society of Automotive Engineers *Truck Ability Prediction Procedure* are not justified, nor are they required to accommodate most heavy commercial vehicles.

Where commercial vehicles make up a substantial portion of the total traffic on an acceleration lane, the length required to accommodate them can be found in Tables II, III, or IV of this study.

Strictly Business

Reflector Cone Caps Increase Effectiveness

The efficiency of trafficones can be doubled by the use of new Reflector Cone Caps, according to the manufacturer. These caps provide a simple way to light up trafficones for night use.

Reflector Cone Caps are constructed of white or red Scotchlite permanently bonded to heavy gauge aluminum. They are 3″ in depth (covering the normal red top of the trafficone). There is no maintenance or up-keep cost.

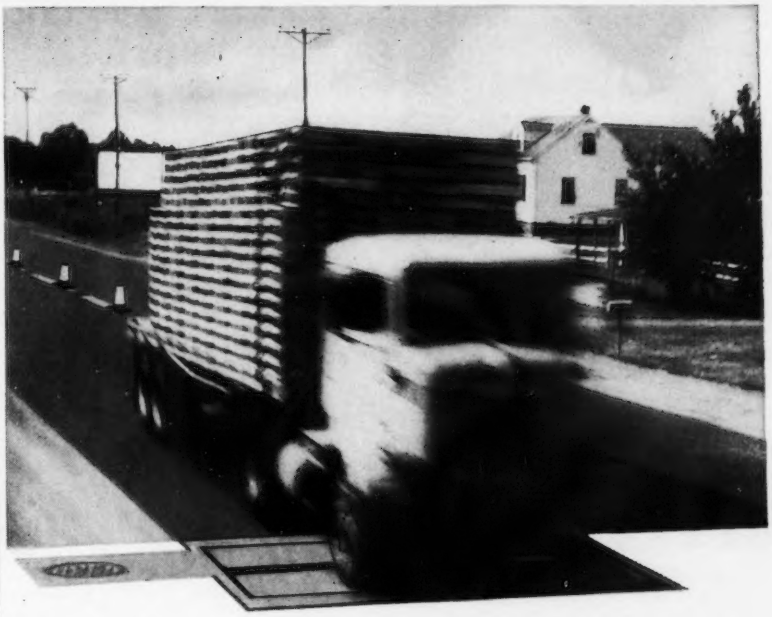
Designed for use on all trafficones, regardless of size, the caps nest perfectly, thus requiring very little storage space. The brilliant reflection offers much needed additional protection during the dangerous, dark hours.

For illustrated literature and further information, write A & B Reflectorizing Co., Dept. P-206, 5508 North Halifax, Arcadia, California.

Street Name Sign Catalog Available

An interesting catalog describing Lake Shore lifetime aluminum day-and- night street name signs is now off the press, and available to those interested.

Lake Shore street name signs are guaranteed forever against rust and are finished in new weather-proof coatings, guaranteed not to crack or peel. Maintenance is practically eliminated entirely, and years of service guaranteed. Write to Lake Shore Markers, Inc., P. O. Box 59, Erie, Pa., and request catalog #515.



Save time...cut truck weighing costs with Cox & Stevens Overload Detectors

. . . DETECT OVERLOADED VEHICLES WHILE THEY ROLL

No more dangerous lineups and delays for weighing . . . no more penalizing legally loaded trucks. When Cox and Stevens Overload Detectors are installed, axle weight violators are screened out and are directed by a signal to a roadside static scale, *while other traffic moves down the highway*. Traffic congestion is eliminated, time is saved, trucking and weighing costs are cut, and only trucks indicated as overloaded need be stopped for static weighing.

Electronic load cells support the scale platform flush with the highway. Load cells are hermetically sealed . . . have no moving parts to wear. Overload Detectors are adjustable to state weight limits, have plug-in components for quick, simple maintenance.

Cox and Stevens electronic motion weighing equipment is now installed in Iowa, Virginia, Minnesota and Oregon. Find out how these scales can help your overload control program today.

Write for Overload Detector Bulletin 3004T or Traffic Research Scale Bulletin 3005T

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29

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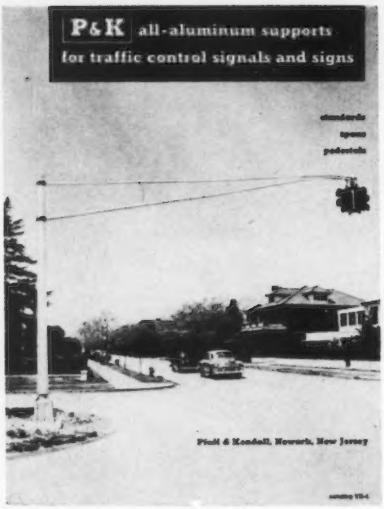

P & K Issues New Catalog

Pfaff & Kendall, 84 Foundry Street, Newark 5, New Jersey, has just issued its new catalog on all aluminum supports for traffic control signals and signs.

The publication illustrates and describes standards, spans, pedestals, and accessories, many of which are newly designed to solve the increasing complexities of traffic control.

For your copy, write to P & K at the above address, Attention: Sales Engineer, Catalog TE-1.

New Film on Traffic Paint Offered

A new film depicting the best methods for selecting and applying traffic paints is now available from Hercules Powder Company. The 16-mm. film "Highway Life Lines" is in sound and color and runs for about 16 minutes.

Against a backdrop of colorful highway scenes from coast to coast, the film covers subjects such as methods of evaluating traffic paints; factors influencing paint performance; and various methods of applying traffic paints.

Using "Parlon" base traffic paints, as an example, the film points out that the selection of "Highway Life Lines" has become a science and that the performance and cost of outstanding traffic paints, on various types of surfaces, can be realistically predicted.

Prints of the film may be obtained from the Advertising Department, Hercules Powder Company, Wilmington 99, Delaware.

A FORWORD LOOK

(Continued from page 211)

(5) the design and physical characteristics of highways; and

(6) such other matters as it may deem advisable and appropriate.

Plans for the study are being drawn with consideration for the activities of a special House Subcommittee on Highway Safety, which is also giving attention to this important subject. The Research Committee of the Advisory Council to the President's Committee for Traffic Safety has agreed, upon our invitation, to serve as a consultant on the study. The initial conference of this group with officials of the Department of Commerce and the Bureau of Public Roads has already been held. This consulting group has traffic engineering representation, of course, but as the study proceeds, I am sure we shall be calling upon others among you for various kinds of information. We want our final report to be a genuinely effective and useful contribution to highway safety.

At the outset we intend to examine the full scope of the accident-prevention program in the United States to see what and where the deficiencies are. To an extent, this will reveal areas where further investigation would be productive. Among the items we feel reasonably sure will warrant pilot studies, at least, are an investigation into the fundamental causes of accidents and the effect of speed and horsepower on accident causation. The Highway Safety Study provides an exceptional opportunity to use the knowledge, experience, and research ability of highway and traffic engineers, and that of many other professions to achieve a reduction in the tragic and wasteful losses that occur on our streets and highways.

Your Immediate Past President, Mr. Charles Prisk, has been appointed to devote his full time to the direction of this study.

Finally we come to the fifth and most difficult of all the studies, what we call the "incremental cost study." The purpose is to provide Congress with a basis for determining an "equitable" distribution of the tax burden among the various classes of persons using Federal-aid highways or otherwise deriving benefits from such highways.

It might be concluded that this is a job for the tax experts, and of little concern to highway and traffic engineers. The Act, however, directs us to study the effect on structural and geometric design, the construction, and the maintenance of Federal-aid systems of the number, size, and weight of vehicles using these systems. It also requires determination of the benefits, both direct and indirect, derived from the improvement of the Federal-aid highways. It is expected that the Congress will be guided to a great degree by the findings of this study in future tax legislation.

In order that we may gauge accurately the magnitude of Federal-aid costs and the consequent tax burden, traffic engineers must estimate the future volume and weight composition of traffic on the interstate and other Federal-aid systems, both rural and urban. In order to measure the effects of vehicle size and weight on highway costs, we must learn the effect of axle and gross loads on road and bridge requirements, and the effect of vehicle size and performance characteristics on highway capacity and design. In this latter field, traffic engineers can and must be of timely aid. Working with the automotive engineers, they can also help us to measure the user benefits to be derived from highway improvements, in terms of savings in operating costs, time savings, reduction of accident costs, and elimination of the strains and discomforts of congested driving.

At this point I wish to take a moment to thank all of you for your recent cooperation in supplying data for the most heavily loaded intersections throughout the country. I have been told that information is now available for 1,000 locations—about four times the number on which the present Highway Capacity Manual was based. The recent data are also far more comprehensive. The results of the analysis, now under way, will provide you with a tool usable in your daily work and one of the most important segments of the information needed in connection with the studies I outlined.

In conclusion, we are faced with a tremendous task. Without knowing the ability and interest of highway and traffic engineers throughout the country, it would be a frightening task. Because we know that the engineering profession will meet its responsibilities, the program as outlined by the Congress will be completed on schedule.

New Publications

Highway Engineering Training Programs.

Special Report 24, Highway Research Board, 2101 Constitution Ave., Washington 25, D.C., 1957, 20 pp.

This report is from the Committee on Education and Training of Highway Engineering Personnel, and was prepared as the result of a suggestion made two years ago that the Committee study present highway engineering training courses and develop a suggested program which would combine the better features of those programs presently in operation.

A questionnaire was circulated to all State Highway Departments, asking for information on their training programs for professional and pre-professional employees. The questionnaires were summarized and reviewed by the departments again. The results are published in this report. Finally, suggested training programs were prepared for graduate highway engineers and for high school graduates. These are summarized in the report.

This publication will be of particular interest to state highway people, but should should be of considerable assistance to all engineers who are concerned with recruiting and training professional people.

Uniform Vehicle Code.

Revised 1956, National Committee on Uniform Traffic Laws and Ordinances, 1604 K St. N.W., Washington 6, D.C., 196 pp., single copies free to officials, other prices on request.

This is the new edition of the Unifrom Vehicle Code, containing all recent revisions including those of last summer.

To be published soon by the National Committtee is the Model Traffic Ordinance, revised to match the Code.

Institute Offers Life Insurance To Members

The Institute of Traffic Engineers, following the pattern of a number of other professional societies, is preparing to offer low-cost life insurance to its members.

The plan, which is being announced by mail to the membership, was approved by the Board of Direction at its January meeting. All dues-paying members will be eligible for the insurance, in fixed amounts depending on the grade of membership held. No medical examination is required, and the insurance is renewable and noncancellable, with waiver of premium for disability and liberal conversion privileges.

The advantage of group buying mean that the cost to members is about half the cost on an individual purchase basis.

Initial enrollment must be between February 15 and April 15.

THE TRAFICOUNTER, JR.

is a simple, sturdy, time-tested device for traffic counting. It is pneumatically actuated by means of the road tube attachment.

Traffic volume is easily read on direct reading counter. Can be rapidly installed anywhere. Rugged construction; will last for years.

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Institute Affairs

Board of Direction Meets in Washington

The Board of Direction met in Washington on Saturday and Sunday, January 5 and 6. A full agenda was considered, of which the following are the highlights:

(1) Approval of an expense budget for 1957 of $71,000, with estimated income of $73,000.

(2) Transfer of 15 members to a higher grade, and election of 22 new members, including one Affiliate.

(3) Decision to investigate formal affiliation of ITE with the Engineers' Joint Council.

(4) Vote to re-affirm present District boundaries for 1957.

(5) Vote to renew invitations to 34 existing sustaining organizations and extend a new invitation to Duncan Parking Meter Co., Chicago.

(6) Approval of a revised draft of a manual on the conduct of annual meetings.

(7) Vote to hold 1958 annual meeting Monday to Thursday, September 22 to 25 (already scheduled for Miami).

(8) Vote to hold 1959 annual meeting in New York City, probably the third week in September, and to notify District 4 that the normal schedule would call for the 1960 meeting in that District.

(9) Vote to embark upon a group life insurance plan for members of the Institute. (More details will be mailed to members in the near future.)

(10) Approval of tentative budget and plans for the Detroit Annual Meeting, scheduled for September 23 to 26, 1957.

(11) Confirmation of Technical Council action in creating Department 8, grouping the several joint committee representatives not formerly organized as a department.

(12) Vote to approve as an informational report the report of Committee 2B, "Civil Service Requirements for Traffic Engineering Positions," and to authorize publication of the report in the magazine.

Massachusetts' Traffic Engineering Achievement Award is presented in Boston. Left to right: Governor Christian A. Herter, Highway Traffic Engineer Edward J. McCarthy, Commissioner of Public Works Carl Sheridan, and New England Section President David S. Johnson. Governor Herter has since been named Undersecretary of State, vice Herbert Hoover, Jr.

(13) Vote to hold the next meeting of the Board in Houston in conjunction with the semi-annual meeting of the Texas Section, probably early in June.

Hand-Tinted Mural Presented by Oregon

A hand-tinted photograph, framed, 32 inches by 44 inches, was presented to the Institute during the January Board meeting by the Oregon Highway Department. Picturing a highway tunnel through Tooth Rock along the Columbia River, the picture will be a fine addition to the Headquarters office.

An engraved plaque on the frame reads:

COLUMBIA RIVER HIGHWAY —
TOOTH ROCK TUNNEL

Presented to Institute of
Traffic Engineers
By Oregon State Highway Department
— Traffic Engineering Division
W. C. Williams, Chief Engineer
F. B. Crandall, Traffic Engineer
January 1, 1957

The Board has expressed its thanks to Mr. Williams and Mr. Crandall.

Student Chapter at Cornell

The former student chapter at Cornell University has been reactivated under the faculty sponsorship of Prof. Taylor D. Lewis (Mem., ITE). The chapter has fifteen members, with Albert H. Woehrle, Jr., serving as president and Sam Codella as secretary-treasurer.

The full list of members follows. All addresses are in Ithaca, N. Y.

Peter Andrews, 320 Forest Home Dr.
James R. Bell, 153 Grandview Court
Chandralad Bunyamanob, 326 Mitchell Street
Sam Codella, 106 Lake Street
Run Darrundono, 208 Delaware Ave.
Peter Eschweiler, 220 Triphammer Rd.
Neil Kravetz, 112 Highland Place
Herman A. J. Kuhn, 1549 Slaterville Road
Robert M. Leary, 325 N. Albany St.
John Sarna, 102 Willard Way
Nid Shiranan, 304 College Avenue
Gi Sugiarto, 208 Delaware Avenue
Mark A. Wiedenmayer, 107 University Avenue
F. E. Wiedle, 875 Highland Road
A. H. Woehrle, Jr., 355 Cascadilla Hall

Section News

INDIANA SECTION

Letter from James H. Cox, Secy-Treas., (1956).

The Indiana Section held its Winter Quarterly Meeting on December 10, 1956 in Indianapolis. There were 38 members and guests attending this meeting. The Section took a Technical Field Trip to the offices of the Metropolitan Plan Commission of Indianapolis. Here the director, *Mr. Calvin Hamilton,* related what they had accomplished after one year, and what they were planning in the future. Mr. Hamilton emphasized the importance of the close cooperation that must exist between the planner and the traffic engineer. The field trip was something new for our Section, and from the comments afterwards, it appears this will become a permanent part of our meetings in the future.

Following the Technical Field Trip, the meeting moved to the Fireside Restaurant for a dinner, and to hear *The Honorable Philip C. Johnson* present his committee's safety program, which will be presented to the 1957 Indiana Legislature for their consideration. Representative *Johnson* gave us a detail explaination on each need, and a copy of each proposed bill designed to meet the need. Briefly the needs were as follows:

1. Statewide compulsory vehicle inspection law.
2. Periodic re-examination of all drivers with special re-examination of drivers involved in repeated accidents or violations.
3. Recodify present driver license and financial responsibility laws to conform to the uniform vehicle code and to strengthen provisions regarding driver improvement and driver licensing.
4. Legislation designed to encourage the expansion of high school driver education and school safety courses.
5. Increase personnel of the Indiana State Police by a minimum of 165 Troopers.
6. Establish a bipartisan personnel program for certain technical employees of the Bureau of Motor Vehicles and the Office of Traffic Safety to insure adequate selection, training, job tenure and effective contination of activities during administration changes.
7. Strengthen present laws relative to the safe operation of school buses and stricter penalties for school bus violations by motorists.
8. Laws necessary to improve the traffic court system of Indiana and to provide for administrative supervision of a uniform traffic arrest and conviction report commonly known as the uniform Traffic ticket.
9. The problem with the drunken driver remains a very serious one.

Following the dinner, a short business meeting was conducted. The results of election of the 1957 officers were announced, and the new officers for 1957 are:

President.....*William H. Bilby*
Vice President.....*James H. Cox*
Secretary-Treasurer *Frank. S. Vukovits*

Charles D. Miller was accepted as an affiliate member of the Indiana Section. The meeting was then closed by the retiring President, *James B. Neff.*

SOUTHERN SECTION

From Section Newsletter, December issue, John Hanna, Secy-Treas.

President *Art White* appointed a Nominating Committee for 1957 Officers. The committee is as follows:

W. O. Shrader ..Montgomery, Alabama
Chairman

Bill Derrick.....Atlanta, Georgia
John Mills.....Richmond, Virginia
Kenneth King New Orleans, Louisiana
Earl Reeder.....Miama, Florida

Art White also writes:
"I wish to take this means of thanking you and the others at the San Francisco meeting for taking over and securing the 1958 meeting of the I.T.E. for Miami."

Karl Bevins reports:
"On the meeting which the Southern Section of the Institute of Traffic Engineers held on September 25, 1956 in San Francisco, California, the following members were present: *William S. Derrick, William O. Shrader, John F. Exnicios, George H. Kunde, J. Duval Lee, Lewis P. Bradford, Robert A. Burch, Paul Ristroph, Marble J. Hensley, Jack W. Chambliss, David F. Dabney, Karl A. Bevins.*

"Since none of the officers were present, Past President *Bevins* called the meeting to order. The only business transacted was to reaffirm the group's solid support for bringing the 1958 Annual Meeting of the Institute of Traffic Engineers to Miami, Florida. The group recessed and reconvened on the 8th floor of the Mark Hopkins Hotel in the room in which the Convention Site Selection Committee was in session. The Site Selection Committee requested that a committee of four be appointed to meet with them since the room would not accommodate the entire group. The committee appointed consisted of *George Kunde, Bob Burch, Paul Ristroph and Karl Bevins.* The remainder of the delegation remained faithfully in the hall outside the meeting room during the entire session. The Site Selection Committee did select Miami for the 1958 Annual Meeting."

Beginning with this issue "Personality Sketches" will be given of our members. The first is an historical sketch of *Bill Mann,* City Traffic Engineer, Nashville, Tennessee:

Born and reared in the Illinois village on the south-west corner of Lake Michigan, *Bill* left there as soon as he could navigate on his own. In high school in Montana, he met Ruth McMurtrey.

When he attended Montana State college for one year, Ruth said she wouldn't marry any farmer, which is why he started off in engineering. The next three years at the University of Colorado, where a degree (1923) in Civil Engineering was won, were the hardest. Agriculture was thereby robbed of a pretty good prospect to make a doubtful addition to the engineering profession. That opened the way for Ruth and Bill to get married in 1926.

After sweating through several engineering jobs and the depression, he wound up in the Illinois Highway Department where good fortune put him in the way of the first traffic engineering that was done by the State.

In 1936, when district traffic engineers were first appointed by Illinois, he was appointed to District 6 at Springfield. Working there close to *Harry Harrison* gave him good experience and in 1941, when Nashville was looking for a traffic engineer—he was the man.

Before getting well established in the job, there was a call for traffic engineers by the Army. He joined up and spent the next three years in the Transportation Corps, almost entirely in the European theater.

Since they have no children, Ruth turned her hand to teaching while *Bill* was in the Army. She likes it a lot and is still at it. If *Bill* can keep her on the job, I think he'll probably retire before too long.

Bill writes, "It has been my pleasure to be a member of and to serve in various capacities in the Institute of Traffic Engineers, the Tennessee Society of Professional Engineers and the Nashville Engineering Association."

Ed Mueller, Assistant Engineer of Traffic and Planning writes from Tallahassee, Florida:

"Recently the State Road Department made a traffic survey of DeLand, Florida, a small city of about 9,000. DeLand has many highways converging on it and has traffic problems more severe than is usual with cities its size. The city cooperated whole-heartedly in all recommendations except that of removing *all* parking on the main street.

"We managed to get three unnecessary traffic signals completely removed. Two others equally unnecessary were converted to manually operated signals during school hours. (It is par for the course in Florida to install 24 hour single dial fixed-time signals for school crossings however minor they may be.) Another signal was recommended to be converted to a semi-actuated installation and this will be done in the future.

"In addition to these recommendations, left turn lanes were painted and marked at every principal intersection. Some removal of parking was necessary to do this and in the end about one-half of the original parking planned to be removed was removed. A 15 MPH "School" Zone was removed from in front of Stetson University also.

"Other recent activities in Florida include the adoption of a new signal portion of the Florida Devices manual. This is completely new and uses the increased uniform national warrant; it really attempts to achieve uniformity. We would be glad to send a copy to anyone interested either for use or review and comment with a view to improving the manual.

"A great deal of activity is presently going on in the highway safety field in Florida. It appears that legislation emphasizing speed control, stricter licensing and enforcement may be forthcoming. Florida at present ranks 46th out of 49 in increased accident experience in the United States.

"Here are thumb nail sketches of new ITE members from the Florida Road Department:

"Junius Payne—Associate Member: Mr. Payne is the pride and joy of our Signs, Signals and Markings Section. He was born in New Orleans and attended New Orleans city schools and Louisiana State University. He has been in private practice of civil engineering in Baton Rouge, Louisiana as member of the firm of Mundinger and Payne and was later engaged in private practice in New Orleans, being president of Payne Engineering Company, Gretna, Louisiana and at the same time Parish (County) Engineer of Jefferson Parish, as well as City Engineer of several small municipalities in the vicinity of New Orleans. During pre-war construction in 1940, *Junius* was office Engineer at Camp Claiborne, Louisana and later Chief of Control Section, Atlanta District Engineer Office. After that he was connected with Planning Division of the Georgia Highway Department, and has been with the Traffic and Planning Division of the Florida Road Department for several years.

"Sherwood Hiller — Associate Member: "Woody" as he is known to all citizens in Tallahassee, mounted Old Paint out New Mexico way back in '49 and loped into Albuquerque to look over the jams at the hitching posts and swinging doors. Then he hung up his spurs and shooting irons and headed for the land of sunshine and bathing beauties. After six and one-half years, a wife and three and one-half children, Highway Research Board and Traffic Quarterly papers, and major studies of Miami, Orlando, Tampa, Sarasota, Palm Beach County behind him, he saddled up and started riding with "Itty" posse. *Woody's* present duties include being Chief Assistant on Florida's Interstate program."

Elaborate preparations are being made for a bang up meeting and technical session March 4 and 5, 1957 in Richmond, Virginia.

The Southern Section, I.T.E. will meet as a part of the Southern Safety Conference which is also meeting with the Virginia Statewide Association.

The tentative traffic engineering program is as follows:

Monday, March 4, 1957.

Morning—Delegates to this Section will attend the General Session.

2:00 P.M.—"The Proposed Interstate Highway System and its Effect Upon Traffic Engineering" — Bureau of Public Roads—speaker to be announced.

3:00 P.M.—"Overhead Signs and Markings —Uses and Design Considerations"—Jesse C. Bullock, Jr., Associate Traffic and Planning Engineer, Virginia Department of Highways.

3:45 P.M.—"Design Features of Richmond Expressway"—John T. Hanna, Assistant Director of Public Safety, Richmond, Virginia.

Tuesday March 5, 1957

2:00 P.M.—"Department of Traffic—Any City U.S.A." A panel simulating the operation of a typical traffic department to answer hypothetical questions regarding traffic engineering activities which might arise in any city. Panel composed of:

Robert A. Burch, Moderator
Traffic Engineer
State of North Carolina
W. S. Derrick, Traffic Signs
Ass't Highway Planning Eng.
Georgia Highway Department
John F. Exinicios, Planning
Ass't Traffic Engineer
New Orleans, Louisiana
Herman J. Hoose, Traffic Signals
Traffic Engineer
Charlotte, North Carolina
Jack W. Chambliss, Surveys
Ass't Traffic Control and Safety Engineer
Mississippi Highway Department

3:30 P.M.—"What is Your Traffic Engineering Problem" The above panel of experts will handle questions from the audience of actual problems existing in various locations throughout the South.

Delegates to the Traffic Engineering Section will have a guided tour of points of interest in Richmond and vicinity with special emphasis on the new expressway which is now under construction.

The Annual Business Meeting of the Southern Section, Institute of Traffic Engineers will be at noon Monday, March 4, 1957 in the Monroe Room, John Marshall Hotel; Richmond, Virginia.

TEXAS SECTION

From TexITE, November issue.

Nomination of Officers

A nominating committee has been appointed by President *M. V. Greer* for the purpose of nominating officers of the Texas Section of I.T.E. for the year 1957. Members of the nominating committee are:

Walter Klapproth—*Chairman*
C. J. Keese
C. F. Braunig

San Francisco, 1956

TEXites *Brandes, Buckman, Chester, Clinard, Fischer, Goodion, Greer, Gregory, Hulett, McEachern, Miller, Nadon, Rice* and *Saylor* attended the 26th Annual Meeting in San Francisco, September 24 through 28. This large representation helped swell the total attendance to the largest yet at an annual meeting.

Congratulations are due the Western Section for arrangement of an excellent meeting. The social functions were most enjoyable and the technical program included discussions of topics of more than ordinary interest.

It is comforting to know that the sophisticated TEXites who resided at the Mark Hopkins have finally received all their baggage which was left in hock.

RESOLUTIONS

26th Annual Meeting I.T.E

Resoltions adopted by the Institute of Traffic Engineers at the Annual Meeting in San Francisco accompany the November issue of TEXITE. Some of the resolutions appear to be good subjects for discussion at the forthcoming Texite meeting.

From Here and There

Gene Maier—Houston

Gene reports that the Board of Direction of I.T.E has tentatively accepted the invitation to meet in Houston with the Texas Section next June. An outstanding meeting is being planned for that occasion.

Harvey Hawkins and *Dave Fielder* are busy with new homes. *Harvey* moved into

his early in November and is now busy with landscaping. It will probably be December before *Dave* gets moved into his.

Gene further reports that Houston is getting delivery of equipment for its new signal program which includes new installation and modernization at approximately 400 intersections.

Bim Greer—Austin

Bim reports that the San Francisco meeting was a good one with the exception the Texas Section lost out its bid to have the 1958 National Meeting in Texas. Miami, Florida was selected as the site. "Failure to get the 1958 meeting for Dallas," says *Bim*, "certainly cannot be attributed to any shortcoming on the part of the Invitation Committee or of the Texas Section members."

Charlie Prisk stopped in Fort Worth on his return trip from San Francisco for a discussion of Expressway Signing with members of the Fort Worth office of the Bureau of Public Roads and the Texas Highway Department.

Bim's final comment was that after trying the role of pedestrian on some of the streets leading to Nob Hill he really appreciated the cable cars.

Paul Rice—Corpus Christi

Paul says that it is questionable at this time whether he will be able to get to the Lubbock meeting in January, but was fortunate enough to attend the ITE meeting in San Francisco just before the Council put a clamp on traveling.

Paul's department was fortunate to gain the services of a Senior Traffic Engineer, *Dean O. Chadwick*, a registered professional engineer with about eight years experience with the Highway Department and Toll Road Authority. (Prospective member!)

Paul states that construction is underway for the High Level Bridge across the ship channel and connecting expressways which should be a big help to traffic movement in and around Corpus Christi.

R. T. Gregory—Waco

About one-third of the conduit has been installed and the stringing of messenger wire for the interconnect cable is underway in downtown Waco. *Greg* says that *Bob Jolliff* has the situation well in hand and that they hope to "fire off" about the first of March.

On October 7, reports *Greg*, Waco began operation of about 5½ miles of one-way streets and the operation has had the unqualified approval of the people. More streets will be added in the near future.

R. H. Oliver—Austin

Dick says he has been busy helping *Sam Roper* check the signing plans on rural expressways in the Houston and Beaumont area.

He states also, (lucky fellow) that he and the wife took a month's vacation visiting New Orleans, the Great Smokies, Ike's 40 acres, Schenectady, Muskegon and Toledo. He states that he felt like a new man after having been in the "groove" so long and he is pretty proud of his old clunker ('48 Plymouth) on which he added some 5,000 miles during the trip.

Joe Nadon—El Paso

We quote *Joe* as follows, "To the many traffic engineers of 'Texite' who may have received some questionnaires from El Paso on one-way street operation, I would like to say 'thanks.' I do not know how these questionnaires were answered, but they must have been potent because at the final hearing on our local problem, even the most vitriolic opponents of the program accepted it without comment. We also had a very valuable assist from all the representatives of our local press, radio and T.V., as well as a highly favorable report from our old friend *Dave Dabney* who was hired as consulting engineer by the local opposition."

Having missed the last couple of Texite meetings, *Joe* is looking forward to seeing the rest of the gang at Lubbock come January.

Bill Brandes—Dallas

Bill, who was Chairman of the Invitation Committee for the proposed 1958 Dallas convention says, "Following recovery from the '58 "Florida blow," as announced from the rostrum about 10:21 P.M. on the fateful night of September 27, he and his wife, Marge, proceeded to see more of California than just the bay area."

"State Highway 1," says *Bill*, "afforded the most pleasure including a brief inspection of the *DeYoung* homestead and the grove of famously-named redwood trees." Given time to sink roots, *Bill* is sure those trees will keep *Skinny's* half-acre from slipping into the Pacific some stormy night.

After driving over Los Angeles' freeways and not getting too fouled up, *Bill* decided they were no harder to drive than Dallas' Central Expressway. He says it's just the matter of always being in the right lane at the right time.

Earl Williams—Wichita Falls

Earl, the unofficial photographer for TexITE, says that Wichita Falls is now in the process of installing 30 trafflex secondary controllers in the downtown signal system. "Upon completion of this installation," says *Earl*, "we will be ready for one-way streets as the controllers will give us the necessary flexibility for progressive, simultaneous or alternate signal timing."

Earl was a participant in the Regional Conference of the Texas Police Association which was held at the Grayson Hotel in Sherman on October 1, and gave a talk entitled "The Traffic Engineer and the Police."

Stewart Fischer—San Antonio

Stu, in a recent letter writes as follows: "We're still head over heels covered with work on all improvements that are being made here in San Antonio. The work on our signal system is progressing well. However, we are running into problems because of the delivery of some of our controllers. It is now doubtful that we will complete the installation according to schedule, and the actual completion will probably be some time next spring. We have completed work on a master and secondary street plan covering the entire city, including the five mile radius over which the city has sub-division control. All requests for zoning all subdivisions and commercial building permit applications are referred to the Traffic Engineer's office for approval, and if they do not conform to good traffic engineering practices, or if the necessary right-of-way for the street system are not either available or dedicated, we recommend denial of the application. So far, the City Planning Commission and the City Council have backed up our recommendations completely. I think that traffic engineering is making great strides in San Antonio."

"As you probably know, we have had funds made available for the construction of about 25 miles of expressway in the next year for this city and the county. This work, plus the big street improvement program, plus the signal work, is keeping us all pretty busy, and San Antonio is becoming a hustling metropolis."

Jack Keese—College Station

Jack reports that during the week of January 14, 1957, the Texas Transportation Institute and the Civil Engineering Department of Texas A&M, the Texas Section of ITE and the League of Texas Municipalities are jointly sponsoring a short school on traffic engineering for the purpose of giving some training to representatives from cities too small to afford trained traffic engineers.

Some of the members of the Texas Section are being asked to participate as instructors. *Jack* says that the total attendance is being limited to 40 and that they anticipate an even better school than was held the previous year.

J. S. Saylor—Dallas

The first phase of Dallas' new one-way street plan went into effect at midnight Saturday, September 8. Commerce and Elm Streets, two major east-west arteries through the downtown area, were made one-way from the Triple Underpass to Exposition Avenue. Olive and Pearl Streets, an existing pair of one-way streets, were reversed. The change affected evoked praise from both public officials and motorists.

The entire male force of the Traffic Control Department spent the night and a good part of the following Sunday installing the necessary signs; painting lane lines, stop lines, and crosswalks; changing signal indications; and other miscellaneous work required.

The old days of hanging a signal in the middle of an intersection on a string for a total cost of $300 are gone. Dallas has on

the drafting board plans for signalizing two intersections on U. S. 75 south of the Trinity River, estimated to cost $19,187 each, including equipment and labor.

WASHINGTON, D.C. SECTION

From Al Voorhees, Secy., Washington, D.C. Section.

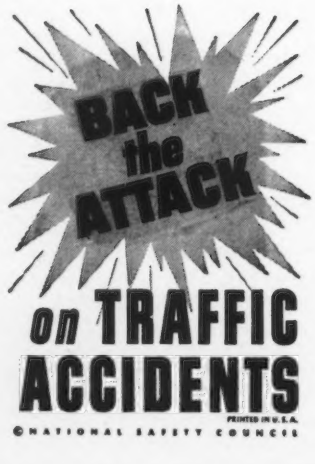
The second meeting this year of the Washington, D.C. Section of the Insitute of Traffic Engineers was held on December 12. This was the first noon meeting held by the Local Section for some time and attendance was the largest experienced for a monthly meeting in many years for the Local Section—72.

Terry Owens, Urban Highway Engineer for the Automotive Safety Foundation, was the guest speaker and presented a very excellent summary of his survey of fifteen urban expressway systems located throughout the country. His discussion centered around the special design and operational aspects of freeways.

The talk was accompanied by slides which illustrated many different designs and operational characteristics of freeways. He also described some of the newer thinking with regard to design of freeways, such as the proposal of making a freeway within a freeway and the use of reversible lanes within a freeway instead of the median strip.

John Mitton, in the discussion period, asked *Mr. Owens* to define the length that a freeway would have to be to be classified as such. The answer very aptly came from the floor—41,000 miles . . . needless to say, there were many representatives from the Bureau of Public Roads at this meeting.

The next meeting of the Local Section will be held at the same time as the Highway Research Board meeting—Wednesday, January ninth—at which time the guest speaker will be the new Federal Highway Administrator, Mr. Volpe.



A Certificate of Achievement for outstanding performance in traffic engineering was presented to the City of Milwaukee by Harry Porter, Jr. (left), Senior Traffic Engineer of the National Safety Council, Chicago. Martin E. Bruening, City Traffic Engineer, accepted the award.

Coming Events

February 18-22—AMERICAN SOCIETY OF CIVIL ENGINEERS—
Convention, Hotel Heidelberg, Jackson, Miss. Contact: ASCE, 33 W. 39th St., New York 18, N. Y.

February 28 - March 1 — ILLINOIS TRAFFIC ENGINEERING CONFERENCE—
9th Annual Conference, Contact: John E. Baerwald, 401 C. E. Hall, Urbana, Ill.

March 3-5—SOUTHERN SAFETY CONFERENCE & EXPOSITION—
John Marshall Hotel, Richmond, Va. Contact: W. L. Groth, Exec. Dir., Box 8927, Richmond 25, Va.

March 3-9—AMERICAN SOCIETY OF PHOTOGRAMMETRY & AMERICAN CONGRESS ON SURVEYING & MAPPING —
Shoreham Hotel, Washington, D. C. Contact: ASP-ASCM, 1515 Massachusetts Ave. N.W., Washington 5, D. C.

March 17-21—AMERICAN SOCIETY OF PLANNING OFFICIALS—
Annual Planning Conference, Sheraton-Palace Hotel, San Francisco, Calif. Contact: ASPO, 1313 E. 60th St., Chicago 37, Illinois.

March 18-19—MASSACHUSETTS SAFETY CONFERENCE—
36th Annual Conference, Hotel Statler, Boston, Mass. Contact: Mass. Safety Council, 31 State St., Boston 9, Mass.

June 25-27—INSTITUTE OF TRAFFIC ENGINEERS, WESTERN SECTION—
Cosmopolitan Hotel, Denver, Colorado. Contact: Jack Bruce, Traffic Engineer, City and County Building, Denver 2, Colorado.

September 9-13—ILLUMINATING ENGINEERING SOCIETY —
National Technical Conference, Biltmore Hotel, Atlanta, Ga. Contact: IES, 1860 Broadway, N. Y. 23, N. Y.

September 23-26—INSTITUTE OF TRAFFIC ENGINEERS—
Annual Meeting, Statler Hotel, Detroit, Mich. Contact: ITE, 2029 K St. N.W., Washington 6, D. C.

October 13-15 — AMERICAN INSTITUTE OF PLANNERS —
Annual Meeting, Congress Hotel, Chicago, Illinois.

October 21-25—NATIONAL SAFETY COUNCIL—
Annual Safety Congress & Exposition, Congress, Conrad Hilton and other Hotels, Chicago, Ill. Contact: NSC, 425 N. Michigan Ave., Chicago 11, Illinois.

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YEARBOOK CHANGES

BACCHUS, Grant A. (Junior)
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BARTON, George W. (Member)
Engineering Director, George Barton & Associates, 600 Davis Street, Evanston, Illinois.

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BILLINGS, William E. (Member)
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CLARK, Edwin F. (Member)
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Civil Engineer IV (Traffic), Traffic & Safety Division, Wayne County Road Commission, 703 City-County Building, Detroit 26, Michigan.

COTTAM, Roy W. (Junior)
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ECKER, John B. (Member)
Senior Engineer, W. C. Gilman & Company, 55 Liberty Street, New York, New York.

ECKHARDT, Frederick J. (Associate)
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Traffic Engineer, Traffic Institute, University of Michigan, Ann Arbor, Michigan.

HANSON, Clarence W. (Associate)
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Associate, Wilbur Smith & Associates, New Haven, Connecticut. SEND MAIL: 45 Sturges Road, Fairfield, Connecticut.

JAFFE, Robert L. (Junior)
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LESSIEU, Eugene J. (Junior)
Planning Technician, The Port of New York Authority, New York. Until June 31, 1957, Student Yale University Bureau of Highway Traffic. SEND MAIL: 381 Norton Street, New Haven, Connecticut.

MELE, Charles N. (Junior)
Traffic Engineer, Bureau of Street Traffic & Parking, 320 North Clark Street, Chicago 10, Illinois.

MILLER, William J., Jr. (Member)
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MORRIS, David E. (Member)
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SAVAGE, Mrs. Margaret W. (Member)
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SAWHILL, Roy B. (Associate)
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SCHWAR, Johannes F. (Associate)
Traffic Engineer, Division of Civil Engineering, Transport Building, Fountain Lane, Pretoria, South Africa.

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- **REFLECTIVE SHEETING;** Look, No Prime Coat
- **TACOMA CUTS SIGN COSTS;** PlyGlaze Case History

vandalism tests

One of the first really definitive jobs of determining relative "vandal and abuse" resistance of standard highway sign materials was completed recently by the Douglas Fir Plywood Association Research and Engineering Department.

The results (see table) may prove something of an eye opener to anyone who assumed metal signs are stronger or more durable than overlaid plywood —or even ordinary Exterior plywood.

Actually, the tests show overlaid plywood has considerably more stamina, and maintains better message legibility after damage than either steel or aluminum. Glass fiber signs, apparently, just aren't in it when it comes to shrugging off abuse.

MATERIAL / TEST	OVERLAID PLYWOOD[1]	ALUMINUM[2]	STEEL[3]	GLASS-FIBER[4]
Flying objects	Fair	Fair	Fair	Fair
Knockdown	Good	Fair	Bad	Poor
Gunfire	Good	Poor	Bad	Fair
Bending (Machine)	Good	Fair	Good	Bad
Racking (Hand)	Good	Good	Very Poor	Very Poor
Average Rating	Good	Fair	Poor	Poor

1. OVERLAID PLYWOOD (both medium and high density) ⅝" thick, 5-ply. Weight: 7 lbs.
2. ALUMINUM—6061-T6 type .081" thick. Weight: 5 lbs.
3. STEEL—16 gauge bonderized. Weight: 11 lbs.
4. GLASS FIBER—resin bonded glass fiber approx. .0145" thick. Weight: 5 lbs.

The 24" square signs tested (steel, aluminum, glass fiber and overlaid plywood) were subjected to abuse under carefully controlled conditions. All (except glass fiber which was factory finished) were given recommended finishes with reflective sheeting on one face.

Tests included flying objects, gunfire, knockdown and bending. Ratings are based on extent of damage and legibility loss immediately after test; prolonged exposure would, of course, further impair legibility—particularly in the case of steel which rusts after protective coating is broken.

If you'd like a copy of the complete report (it's a 32-pager, complete with detailed procedures and photos) simply mail coupon.

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PlyAloy (medium density overlay) panels are recommended for non-reflectorized signs. If reflective sheeting is used, panel should be given prime coat.

case history

The City of Tacoma (Wash.) has sharply reduced costs by switching to PlyGlaze traffic control and regulatory signs. Of the city's almost 8,000 signs, 7,380 are PlyGlaze, and the others are being replaced as they are damaged. About 60% are reflectorized.

According to Yosh Kosai, city traffic engineer, the PlyGlaze signs have two important advantages: 1. *Cost;* based on current standards and specifications, PlyGlaze signs are less expensive than metal. 2. *Durability;* PlyGlaze signs last longer. Vandals can't wrap them around posts, nor do they chip or rust when struck by rocks or bullets.

The changeover was initiated by R. E. Schmidt, Kosai's predecessor. The first PlyGlaze signs were installed in 1951. After 6 years appearance and legibility remain excellent. The only significant damage has been from knock-down and

even though the posts had to be replaced, the signs themselves have remained in service.

description, specifications

PLYGLAZE:* Exterior plywood with high-density phenolic resin-fiber overlay fused to both sides of panel. Overlay is hard, glossy, abrasion resistant. Ideal base for reflective sheeting. Colors: buff, black.

Specification: PlyGlaze (B-B) 60/60 High Density Overlaid fir plywood, manufactured by St. Paul & Tacoma Lumber Co.

PLYALOY:* Exterior plywood with smooth, durable medium-density overlay on one or both faces. Overlay is ideal paint base; has texture similar to expensive drawing paper. Color: buff.

Specification: PlyAloy Medium Density Overlaid fir plywood, faced both sides (F2S) . . . or faced one side (F1S) . . . manufactured by St. Paul & Tacoma Lumber Co.

*Both PlyGlaze and PlyAloy meet U.S. Commercial standards, are DFPA-Inspected. Available in standard plywood sizes, thicknesses.

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SKILES, Gerald W. (Associate)
Senior Traffic Engineer, Department of Traffic, Los Angeles.
SEND MAIL: 12318 Sarah Street, Studio City, California.

SMOOT, A. Glen (Member)
City Traffic Engineer, City Hall, Reno, Nevada.

SUMNERS, James H. (Associate)
Office Traffic Engineer, Mississippi Highway Department.
SEND MAIL: 353 West Northside Drive, Jackson, Miss.

VUKOVITS, Frank S. (Associate)
Assistant City Traffic Engineer, Traffic Engineering Department. SEND MAIL: 1830 Pershing, South Bend 28, Indiana.

WEAVER, C. Reynolds (Associate)
Transportation Consultant. SEND MAIL: 2500 Wisconsin Avenue N.W., Washington 7, D.C.

WHITE, Frank T. (Junior)
Assistant Highway Engineer, California Division of Highways, San Francisco. SEND MAIL: 2600 Woolsey Street, Berkeley 5, California.

WILEY, Eric S. (Junior)
Director, Traffic Engineering Dept., City of Windsor, 258 Chilver Road, Windsor, Ontario, Canada.

MEMBERSHIP APPLICATIONS

The following applications have been received since the list of applicants published in the December issue.

APPLLICATIONS FOR TRANSFER

CLEARY, Thomas Mathew
Assistant Traffic & Safety Engineer, New York State Thruway Authority, P. O. Box 189, Albany, New York.
December 26, 1956 for MEMBER grade.

COLBY, Edwin F.
Assistant Traffic Engineer, City of Providence, 147 Fountain Street, Providence 3, R. I.
January 7, 1957 for MEMBER grade.

ELLIOTT, Earnest Wilfred
Chief Planner, Connecticut Survival Plan Project, 92 Farmington Avenue, Hartford, Connecticut.
December 6, 1956 for ASSOCIATE grade.

EWENS, William Edward
Consulting Engineer, 362 Morrison Road, Oakville, Ontario, Canada. January 5, 1957 for MEMBER grade.

KLETT, William G.
Traffic Engineer, Minnesota Department of Highways, 1084 University Avenue, St. Paul 4, Minnesota.
December 26, 1956 for MEMBER grade.

WILEY, Eric Samuel
Director, Traffic Engineering Department, 258 Chilver Road, Windsor, Ontario, Canada.
December 14, 1956 for ASSOCIATE grade.

NEW APPLICATIONS

ARTALE, Jack Anthony
Highway Designer, Goodkind & O'Dea, Consulting Engineers, 610 Bloomfield Avenue, Bloomfield, New Jersey.
January 2, 1957 for JUNIOR grade.

HORN, John William
Assistant Professor, Civil Engineering, North Carolina State College of Engineering, Raleigh, North Carolina.
December 19, 1956 for JUNIOR grade.

KARNIG, Barkev
Chief, Traffic Operations Division, General Directorate of Highways, Karayollari Umum Mudurlugu, Trafik Fen Heytei Mudurlugu, Ankara, Turkey.
December 19, 1956 for ASSOCIATE grade.

KLINCK, John Henry, Jr.
City Engineer, 824 Newark Street, West Palm Beach, Fla.
December 26, 1956 for JUNIOR grade.

KUCHINSKI, Dennis Donald
Traffic Safety Engineer, Alberta Department of Highways, Highways Building, Edmonton, Alberta, Canada.
December 29, 1956 for MEMBER grade.

LACOSTE, Jean
Director of Traffic, City of Montreal, City Hall, Montreal, Quebec, Canada.
November 20, 1956 for ASSOCIATE grade.

WEGEL, Charles Arthur
Traffic Commissioner, City of Hamilton, Room 301, Municipal Building, Hamilton, Ohio.
January 7, 1957 for JUNIOR grade.

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(Continued from page 238)

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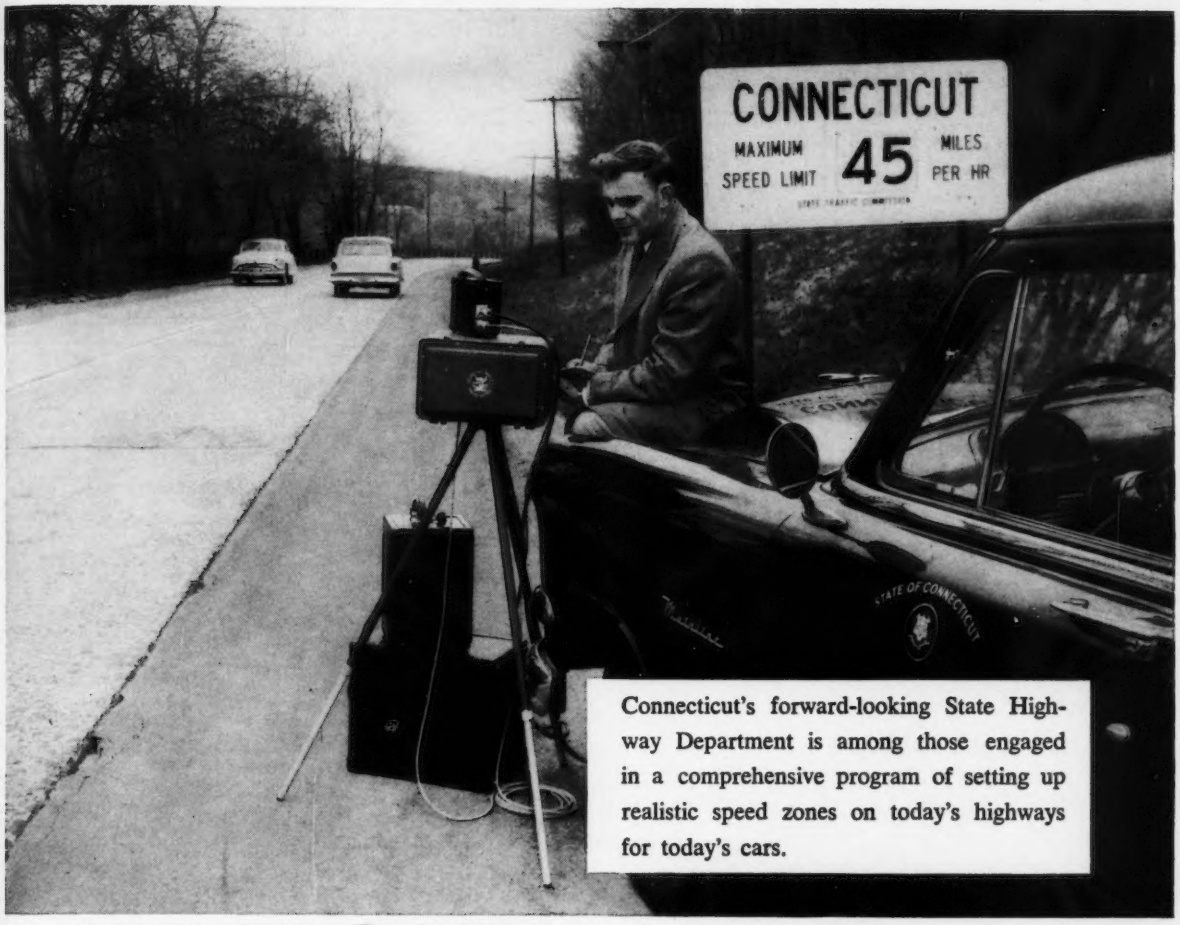

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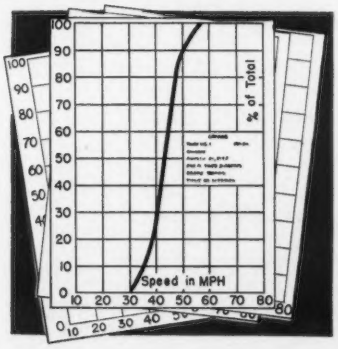

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